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BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

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SUMMARY OF RECENT ABSTRACTS.*

VIII. TYPHUS GROUP OF FEVERS.

General.

HERZIG (p. 985) reports an outbreak of fever in persons upon whom lice used for the preparation of anti-typhus vaccine were fed in Weigl's laboratory. Rickettsia were found in the blood of the patients and in the lice, and resembled *R. quintana* of trench fever. They were extracellular. WERNER (p. 986) states that in this outbreak the symptoms corresponded with those of trench fever as seen in the war of 1914–1918.

Human sera giving significant agglutination of *Proteus OX19*, *OXK* or *OX2* are reported by SHORTT (p. 982) from the Madras Presidency.

COX (p. 984) cultivates the Rickettsia of various forms of typhus by inoculation into the embryonic membrane enclosing the yolk mass of the developing fowl embryo. The embryo is frequently killed by the fourth day, but passage from egg to egg is possible and the virulence is enhanced.

RAYNAL and FOURNIER (p. 983) note that in guineapigs orchitis may be produced by injection of material containing *Bact. paratyphosum B* or *Spirillum minus*. These results may be confused with the Neill-Mooser reaction of the different forms of typhus, but the finding of *Bact. paratyphosum B* and the curative effect of novarsenobenzol help to differentiate them respectively from typhus. The serological reaction, the temperature chart and the characters of the swelling also help in differentiation. The scrotal reaction is rare with the virus of epidemic typhus but occurs with most other forms, especially with murine.

BLANC and NOURY (p. 982) describe a temporary local skin immunity in rabbits inoculated with the virus of murine typhus and boutonneuse fever, which is not correlated with general and visceral immunity. GIROUD, in two papers (pp. 982, 983) confirms this finding and also shows that local skin reactions are most marked in animals which are least susceptible to general infection.

* The information from which this series of summaries has been compiled is given in the abstracts made by the Sectional Editors in the *Tropical Diseases Bulletin*, 1939, Vol. 36. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

Proteus OX19 type. Vectors: louse and flea.

STARZYK (p. 464) shows that at laboratory temperature *R. prowazeki* in human serum remains virulent for 6 days and in dried lice or excreta up to 60 days; at 5°C. virulence is retained in dried louse intestine for 6 months. These findings are of epidemiological importance in showing how infection may be carried in infected clothing over long periods. BLANC *et al.* (p. 464) quote evidence to suggest that the dried excreta of fleas infected with murine typhus can transmit infection to man if placed on the nasal mucous membrane or conjunctiva, or swallowed in water. It is possible that louse-borne typhus may be transmitted by the oral route in a similar way. The authors go further than Starzyk, and state that dried excreta of lice or fleas may remain infective for at least 12 months; it may therefore be possible for infection to be carried over from one epidemic season to the next without any actual cases occurring in the non-epidemic season.

In the *Bulletin de l'Institut d'Hygiène du Maroc* (p. 988) it is pointed out that the epidemic of typhus in Morocco was brought on by the migration of the rural population into the cities and into hutments thrown up around the towns, on account of the failure of the crops in the country districts and the consequent danger of starvation. The cause of the failure of the crops was drought and the importance of extensive irrigation schemes is stressed. Other methods of prevention are mentioned. FOURNIER (p. 988) reports that typhus in Algeria during 1937 occurred in small rural epidemics, principally during winter and spring, and was relatively mild.

Investigating the typhus which occurs in sporadic fashion in the Bhim Tal area of the Kumaun Hills, BLEWITT (p. 461) found no evidence of infection in about 1,000 ticks collected from animals and man or from the scrub. He inclines to the opinion that the disease is louse-borne and that infection is imported along the extensively used trade route through the valley. Discussing an outbreak of typhus in the Viceregal bodyguard at Dehra Dun in 1929 THOMPSON (p. 990) concludes that these were cases of true louse-borne disease and not due to ticks. This area is not far from Bhim Tal referred to by BLEWITT.

PIJPER and CROCKER (p. 468) state that in S. Africa epidemic typhus, presumably louse-borne, and murine typhus produce agglutinins to *Proteus OX19*, *OX2* and *OXK*, in low dilutions only, whereas in Europe epidemic typhus produces agglutinins to *Proteus OX19* only. The virus of S. African epidemic typhus immunizes against murine and tick typhus; that of murine immunizes against tick typhus but not epidemic typhus; that of tick typhus does not immunize against the other two. GEAR (p. 996), however, disputes this finding. In louse-borne typhus he has found agglutination of *Proteus OX19* in high titre and of *OXK* only irregularly. This form, therefore, is serologically similar to classical European typhus. In one case of murine typhus studied the findings were similar to those seen elsewhere.

SCAFFIDI (p. 989) details the clinical features of typhus seen in the natives of N. Ethiopia, mentioning especially the fact that in black skins the rash is often transient and often absent. The disease varies from mild to severe and fatal forms, and evidence is quoted to show that it is louse-borne and that the Neill-Mooser reaction is not

given in guineapigs. The Weil-Felix reaction is positive but the strain of Proteus agglutinated is not given. GIUNTA and D'IGNAZIO (p. 989) claim excellent results in Addis Ababa from a form of treatment in which vitamins B_1 and C are used together with mercurochrome injections. Lumbar puncture is practised if the cerebrospinal fluid is under pressure and subcutaneous glucose is employed together with cardiac stimulants.

The strains of typhus virus isolated in Manchuria by IWATA (p. 995) fall into three classes, murine, intermediate, and epidemic; the first is the least severe and the last the most severe form and the scrotal reaction is constant only in the first and does not occur in the last.

JORDAN and FLETCHER (p. 990) point out that a disinfectant containing *impure* cresylic products, to which 4 per cent. of ammonia was added, was lethal to lice and their eggs in one hour. Purified preparations such as Lysol, Izal, etc., were only slightly toxic even with the addition of ammonia.

LECCISOTTI (p. 461) found a positive Weil-Felix reaction in 47 of 93 rats examined in Taranto.

DYER (p. 991) states that endemic typhus has gradually spread in the S.E. United States from the towns to the country districts and that the numbers recently reported are much greater than those found a few years ago. Practically all the small rodents tested have been found susceptible. KEMP (p. 991) states that in Texas infection is contracted in workshops or stores or in rat infested houses. RUIZ CASTAÑEDA (p. 994) describes a mild form of typhus, probably of murine origin, in Mexico; *Proteus X19* is agglutinated and the Neill-Mooser reaction in rats is given. It is thought that spread may take place through lice but spread through the ectoparasites of rodents cannot be excluded.

MATHEW (p. 469) reports human cases of typhus of the murine type in N. Queensland.

In the epidemic of typhus in Shanghai during 1938 RAYNAL (p. 464) found that the virus isolated from human patients was identical with that isolated from rats in the houses of patients, and that it produced fever and orchitis in guineapigs. It is probably therefore a murine virus.

BRUNEAU (p. 993) failed to produce fever, in natives of Tonking suffering from nervous diseases, by the injection of murine virus, and concludes that in these natives many cases of infection may pass undetected.

From rats captured in Kuala Lumpur, LEWTHWAITE (p. 463) isolated two strains of the *Proteus X19* type of typhus virus. From rats on a plantation where tsutsugamushi was common, a strain which apparently caused agglutination of *Proteus X19* and *Proteus XK* and which gave complete cross immunity with the town rat strain was isolated. Although with this strain cross immunity with the virus of tsutsugamushi was indefinite, transmission experiments with the rat flea and guineapigs produced in one animal a definite *Proteus OXK* type of infection. This apparent transmutation from the *Proteus X19* to the *Proteus XK* type may be explained by the possibility that both types were present in the original material, but the matter is being further investigated.

From the blood and brains of rats and guineapigs infected with murine typhus, ANIGSTEIN and LAWKOWICZ (p. 993) cultivated, on Noguchi's semi-solid agar medium, 6 strains which were definitely

rickettsial in appearance, and two which were strains of bacilli resembling Proteus. The latter were motile, fermented carbohydrates with the production of acid and gas, and did not produce indol.

PHILIP and PARKER (p. 466) show that the murine virus can be isolated from rats up to 370 days and from mice up to 150 days after infection, but that with Rocky Mountain fever and boutonneuse fever isolation was not possible after 30 days.

VIOLLE (p. 467) has succeeded in infecting pigs, rats, guineapigs, rabbits and puppies by feeding them on material, such as the brain of guineapigs and the urine of white rats, infected with murine typhus. He (p. 994) has also succeeded in infecting rats by feeding them upon bread soaked with the urine of rats and men suffering from murine typhus. He suggests that man may become infected by consuming food soiled by the urine of rats. This suggestion has been made before, see this *Bulletin*, 1938, Vol. 35, p. 782. Experiments by LE CHUITON and PENNANÉAC'H (p. 465) suggest that though infection with the murine virus by the respiratory tract can probably take place, it can only be exceptional.

LORANDO (p. 992) reports double orchitis in a human case of murine typhus.

BOTZARIS (p. 470) noted an increase in red blood cells in guineapigs infected with endemic typhus. There was leucopenia during the febrile period with leucocytosis on convalescence.

In investigations carried out on *Myospalax fontanieri*, a small rodent, infected with typhus, ZIA and LIU (p. 472) found that agglutinins for Rickettsia and for *Proteus X19* were both produced, but that those for Rickettsia appeared earlier than those for *Proteus X19* and did not persist so long. The titres for the two agglutinins were not parallel in the same animal.

Proteus OXK type. Vector: mite.

The endemic typhus of New Guinea is of the *Proteus XK* type and resembles tsutsugamushi. GUNTHER (p. 478) shows that the patients always give a history of a recent visit to mite infested country and that the primary sores occur in positions favoured by mites. All persons entering the mite infested bush or swamps are freely bitten but the cases of disease are relatively few; possibly the common mite *Trombicula hirsti* is only rarely infected, or possibly it is some less common species which is concerned. Transmission from rodent to rodent is mentioned as a possibility through mites. In New Guinea GUNTHER and SCHROEDER (p. 1000) report 46 cases of the *Proteus OXK* form of typhus, with a mortality of 20 per cent., since 1934. All were white people and no native case has been seen. The area is infested with mites and bush rats. They advise excision of the primary sore. MATHEW (p. 469) points out that in N. Queensland the patients with typhus, whose sera agglutinated *Proteus OXK*, were field workers, especially those who were engaged in clearing scrub. The bites of mites and ticks are frequently found on such workers; in 17 cases a primary sore was present, in 30 none was seen and in 24 there was lymphadenitis. Positive Weil-Felix reactions were given by the sera of a number of rodents examined.

KAWAMURA and YAMAMIYA (p. 1000) report 32 cases of tsutsugamushi from the Pescadores; *Proteus OXK* was agglutinated and a primary sore was seen in all. The disease is less severe than that seen in Japan. BRUNEAU and CHAPUIS (p. 999) report a case of

typhus with agglutination of *Proteus OXK* from Hanoi. WIJERAMA (p. 1000) reports two cases of the *Proteus OXK* form of typhus from Ceylon. There was no rash or primary sore. Orchitis developed in a guineapig inoculated with the blood of one of these.

HEINEMANN (p. 479) reports 3 cases of second infection with mite-borne typhus in 256 cases seen. The second attacks occurred between 1 and 2½ years after the first and it seems that little, if any, immunity from the first attack was present.

Indeterminate type. Vector: tick.

DYER (p. 991) points out that spotted fever is no longer confined to the Rocky Mountains, but is now found in Eastern Canada, British Columbia and Brazil. PILCHER (p. 474) reports two cases, the first to be diagnosed, from the New England area. JORDAN (p. 475) reports on a number of cases of Rocky Mountain fever in Iowa; ticks (*Dermacentor variabilis*) collected in affected areas were shown to be infected. GIBBONS (p. 474) found no evidence of infection with the virus of Rocky Mountain fever in 30,000 ticks collected in Western Canada. BISHOPP and SMITH (p. 475) give an account of the bionomics of *Dermacentor variabilis* which is the principal vector of Rocky Mountain fever in central and eastern U.S.A. Dogs and horses are infested but rabbits are of little importance, and the principal host of the immature stages is the meadow mouse *Microtus pennsylvanicus*. Adult ticks are most abundant in spring and early summer. Derris powder forms a suitable base for a dog wash.

PHILIP and DIAS (p. 998) failed to effect transmission of Rocky Mountain fever through four different genera of triatomid bugs.

DAVIS and PARKER (p. 477) show that in Rocky Mountain fever agglutination of *Proteus X19* may not be produced, or if positive may be weaker than, equal to, or stronger than that of *X2*. Similarly agglutination of *Proteus X2* may be negative or positive.

DIAS (p. 477) states that *Amblyomma striatum* and *A. cajennense*, found on dogs in Brazil, are known vectors of Brazilian spotted fever, and that sera of dogs have been found to agglutinate various strains of Proteus. The dog is therefore probably a reservoir of the disease, as in Rocky Mountain fever and boutonneuse fever. TRAVASSOS (p. 478) reaches a similar conclusion in regard to the São Paulo disease.

DE MAGALHÃES (p. 478) has proved that *A. cajennense* can transmit the fever of Minas Geraes, but this may also be carried by *Cimex lectularius*. He further (p. 998) finds that the blood of patients is not usually infective during the incubation period but remains infective up to the 18th day of disease. In nature the virus has been found in the rabbit, opossum and preá [the Brazilian opossum] and in *Amblyomma cajennense* and *Cimex lectularius*. The virus seldom passes through an L5 filter candle; it can be cultivated on the chorio-allantoid membrane of fowl embryo. The virus does not pass through healthy skin.

GEAR (p. 996) has seen two types of tick bite fever in S. Africa. One is relatively mild, with constant primary sore, and is carried by larval ticks (*Amblyomma hebraeum*) from veldt rodents. The other is severe and may be fatal, the primary sore is not always seen, it is contracted in the city and suburbs of Johannesburg and is carried from domestic dogs by the dog tick *Haemaphysalis leachi*. The viruses of these two forms are identical and the author considers that the differences noted in the diseases are due to the fact that the former is contracted by

young people from larval ticks in the veldt and the latter by older people from ticks from domestic dogs. They resemble Rocky Mountain and boutonneuse fevers. He (p. 997) gives a list of complications seen in tick bite fever on the Witwatersrand. PIJPER and CROCKER (p. 468) find that tick bite fever of S. Africa and boutonneuse fever, though resembling each other in many respects, do not give cross immunity.

OLMER and OLMER (p. 473) state that the virus of boutonneuse fever, although closely related to that of Rocky Mountain fever, can be differentiated from it and from all other forms, and is therefore a fixed virus possessing its own individuality. BOISSEAU (p. 473) inoculated the virus of boutonneuse fever into the skin of his own arm. A local lesion developed in 36 hours and began to recede on the seventh day, at which time general symptoms commenced. The Weil-Felix reaction was positive for *Proteus OX19* in 1/2000 dilution. The course of the disease was relatively mild. He (p. 466) shows that the entire testis of a guineapig infected with boutonneuse fever can be preserved in glycerin saline and that the virus remains active for 11 days at 0°C. and for 40 days at —10°C. [see also STARZYK above].

Vaccination.

ZINSSER *et al.* (p. 1002) have cultivated Rickettsia of murine and epidemic typhus on agar slopes to which double strength Tyrode solution with horse serum is added. Growth took place when pieces of infected tissue were placed on the agar and subculture was easily carried out by mixing normal mouse embryo tissue with the infected tissues and inoculating fresh tubes with this. Large amounts of Rickettsia for the preparation of vaccine can be obtained in this way, and animals inoculated with the vaccine killed with phenol or formol were immune to test doses. FITZPATRICK (p. 998) has cultivated the Rickettsia of Rocky Mountain fever on agar slopes and mouse embryo tissue. ZIA *et al.* (p. 992) give details of their method of cultivating the Rickettsia of murine typhus on the Zinsser agar-tissue medium. HITZ (p. 466) has cultivated *R. prowazeki* successfully in a medium based on that of Maitland and Maitland, with human ascites fluid in place of Tyrode solution.

SCHWEICKHARDT (p. 471) has prepared vaccine against Mexican typhus by the use of Zinsser's method of irradiating infected rats, and finds that protection is afforded, though the vaccine does not protect to the same extent against the European virus. [The fact that the virus of Mexican typhus gives orchitis in guineapigs seems to point to a murine origin.] Horses immunized with this vaccine provided serum which was used with some success in treatment. VEINTEMILLAS (p. 1002) reports success in trials of vaccine prepared from irradiated rats, and since 3 or 4 doses protect man even against the epidemic virus he proposes to use the vaccine on a large scale in Bolivia.

Doctors and nurses exposed to typhus in Peiping Medical College Hospital are each inoculated with material obtained from 100 infected lice, in three doses at weekly intervals. LIU *et al.* (p. 468) show that of 121 sera tested within 3 months of such inoculation, 37 were negative with emulsions of Rickettsia and 16 negative with Proteus. MARIANI (p. 1001) states that vaccination by the Weigl method has been largely used in the Ethiopian highlands. Reactions are slight and

although a few cases of disease have been seen in vaccinated persons, these have been mild in character.

BLANC and BALTAZARD (p. 471) use a vaccine prepared from dried faeces of *Xenopsylla cheopis*, infected with murine virus, suspended in saline to which bile is added, for protection against epidemic typhus. LAURENS *et al.* (p. 1000) in Morocco have seen epidemic typhus occurring in men who had been vaccinated with a living murine virus, and suggest as a reason that it is impossible to maintain the virulence of the virus constant and that it loses efficacy if kept too long. They consider that the use of dried flea excreta may overcome these difficulties. GAUD (p. 1001) gives epidemiological facts from which he concludes that in Morocco the use of bile treated vaccine prepared according to the method of Blanc was largely responsible for controlling the epidemic of 1937–1938.

An infective agent in ticks in Montana.

This organism is referred to here because, although not apparently belonging to the typhus group, it is akin to Rickettsia.

DAVIS *et al.* (p. 479) describe a Rickettsia-like organism obtained from *Dermacentor andersoni* in Montana. This passes through Berkefeld N and W filters but not through a Seitz disc ; it causes a fatal illness in guineapigs but gives no cross immunity against typhus or Rocky Mountain fever. Transmission by *D. andersoni* was proved possible. The virus is probably similar to that of Australian Q fever. DYER (p. 986) further states that this organism does not produce agglutinins for strains of *Proteus X*, or scrotal reaction in guineapigs. Infection with the virus of Australian Q fever protects against this new organism. One human infection observed was very similar to Q fever, and serum from this person and other sera from cases of Q fever all gave identical results in the agglutination of suspensions of *Rickettsia burneti*. *C. Wilcocks.*

TRYPANOSOMIASIS.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

BRIERCLIFFE (p. 694) gives an account of the work done in Nigeria during 1938, when 378,109 persons were examined by the sleeping sickness teams and the total cases found in the whole colony numbered 35,133. He gives an account of experiments on the premunization of animals with *T. vivax*. In a sleeping sickness report on Nigeria for 1939 (p. 695) it is shown that the work of the control service financed by the Colonial Development Fund consists of the preparation of local protective clearings and of exterminating tsetse in areas into which the population is moved in numbers large enough to allow the areas to be maintained free from fly. An allowance of 4·3 acres per head of population should be allowed and the project of a fly-free corridor 70 miles long by 10 miles wide is envisaged. It is pointed out that during the last few years the decrease in sleeping sickness has been due more to treatment than to protective measures, and figures are given to support this. NASH (p. 696) has described the amount of clearing of islands of forest in Northern

Nigeria, which serve as permanent homes for *Glossina tachinoides*, necessary to exterminate the fly during the hot, dry season. As *G. morsitans* resists high temperatures and low humidities, complete clearing is required for the extermination of this species.

In one district of Nigeria HARDING (p. 697) has found a close correlation between the sleeping sickness incidence and the death rate from all causes. This district lies in the middle of a sleeping sickness belt. In a second district on the edge of the belt, however, there was no correlation and the author concludes that here, during the period under review, the disease was of a non-fatal kind.

HAWKING (p. 697) has cultivated *T. gambiense* as readily in the blood of patients with sleeping sickness as in that of normal persons. TARABINI CASTELLANI and MERIGGI (p. 698) show that *T. gambiense* injected into the skin of guineapigs produces no cutaneous reaction. STEINFELD (p. 698) has failed in attempts to destroy arsenic-resistance in trypanosomes by means of various physical and chemical agents, but reports that in some experiments partial or temporary reduction in resistance was observed. JACK (p. 699) discusses larval growth in *Glossina morsitans*, and larviposition in relation to blood meals. RICHARDS *et al.* (p. 699) discuss the system of nomenclature for tropical woodland types of importance in relation to Glossina. YORKE (p. 700) has summarized his recent work on various aromatic diamidine compounds in the treatment of trypanosomiasis, leishmaniasis and babesiasis. DEVINE (p. 700) has studied the changes in blood sugar and urea in animals as a result of injection of different doses of 4 : 4′-diamidino stilbene.

HAWKING (p. 701) has investigated the concentration of Bayer 205 in the blood of treated patients and points out that there is a great variation between one person and another. The drug may be found up to 9 months after the last injection, but cannot be detected in the cerebrospinal fluid by chemical means.

DUBOIS and KOHN (p. 701) report work which suggests that in infected animals treated with Bayer 205 the action of the drug is not to prepare the trypanosomes for destruction by phagocytes and that it does not depend on the integrity of the reticulo-endothelial system. KLEINE and KUNERT (p. 702) infected calves with *T. rhodesiense* and treated them with Bayer 205 (which is of little value in natural trypanosomiasis of cattle). All the treated calves were immediately cured but controls, which remained in good condition, continued to harbour trypanosomes in the blood for 7 to 9 months.

VAN HOOF *et al.* (p. 703) show that Bayer 205 protects guineapigs against subsequent infection by *T. gambiense* for a considerable time. They could not find evidence of antibody formation in infected and subsequently cured animals, or that cured animals are constantly more protected than normal animals which had received the drug. Although Bayer 205 is a prophylactic of the first order the authors draw attention to the danger of masking the disease unless the whole population is examined and the infected are treated, and they lay down a system of prophylactic dosage.

VAN DEN BRANDEN (p. 705) has specified a toxicity test for Germanin and allied drugs.

SICÉ (p. 705) gives an account of the good results obtained by the synergic treatment, with tartar emetic and atoxyl, or moranyl and tryparsamide, of patients with blood-gland or meningeal infections

respectively. KOPP and SOLOMON (p. 705) give a detailed account of the complications which may follow the use of tryparsamide. These are visual, nitritoid, gastro-intestinal, cutaneous, cerebral, neuritic or of other less well defined types. KOLMER *et al.* (p. 708) found that tests of mobility are not suitable for estimating the spirochaeticidal and trypanocidal effects of the arsphenamines *in vitro* but YORKE in comment criticizes the technique employed.

BROOM and BROWN (p. 708) show that substrains of *T. brucei* maintained by cyclical passage resemble other substrains, derived from the same parent strain, in serological type, with certain detailed differences. Different strains do not necessarily resemble each other.

SCHILLING (p. 709) gives results of his work in Tanganyika Territory which indicates that a series of inoculations of calves with minute numbers of *T. congolense* leads to the production of immunity against natural infection, and that the offspring of immunized animals are themselves resistant.

HOARE (p. 710) shows that *T. evansi* is incapable of development in Glossina. He suggests that *T. evansi* may have originated from *T. brucei* by the introduction of the latter into localities free from Glossina and its subsequent propagation by direct passages; the behaviour of *T. evansi* is similar to that of non-transmissible strains of *T. brucei* after prolonged maintenance by direct passages in mammals.

KLIGLER *et al.* (p. 710) have investigated the antigenic composition and immunizing properties of *T. evansi* and *T. lewisi*. Injection into animals of dead *T. evansi* produces partial and transient immunity, but drug treatment of an active infection gives rise to solid immunity of considerable duration.

STONE and THOMPSON (p. 711) show that *T. equiperdum* may be alive and infective after 14 months in frozen rat blood.

Chagas's disease.—DIAS (p. 712) discusses the nomenclature of *T. cruzi*.

MAZZOTTI (p. 712) found differences in virulence of strains of *T. cruzi* obtained from Triatomidae of different species in Mexico, and also in trypanosomes from the same species but from different areas. The frequency of passage from bug to mammals may account for these variations. He (p. 712) inoculated small and large numbers of *T. cruzi* into mice but the results did not vary in a constant manner with the numbers injected.

MAZZOTTI (p. 713) reports that five species of Triatoma and one of Rhodnius have been found to be infected in one part of Mexico. He (p. 713) states that in Mexico there are 15 species of Triatomidae of which 9 are found to be naturally infected. Three of these are newly discovered vectors. LENT (p. 713) shows that *Clerada apicicornis*, though normally phytophagous, may under certain conditions suck blood, and that metacyclic development of *T. cruzi* takes place in it. There are 28 species of Triatomidae which have been found naturally infected. GALLARDO (p. 714) describes the effects of the bite of *T. rubrofasciata*.

MAZZA *et al.* (p. 714) describe a case of infection by the bite of *T. infestans*. MAZZA *et al.* (p. 715) describe an acute case in which the swelling of the face [caused presumably by the bite of Triatoma] persisted for 3 months. MAZZA and MIYARA (p. 715) describe a case of Chagas's disease in which a generalized rash appeared, lasting for 14 to 17 days, without itching or desquamation. *C. W.*

NIGERIA: REPORT ON THE MEDICAL SERVICES FOR THE YEAR 1938 [BRIERCLIFFE (R.), Director of Medical Services]. Appendix B. pp. 57–65.—**Report of the Sleeping Sickness Service, 1938.**

The scheme for the expansion of the sleeping sickness service in Nigeria came into operation in April 1937. Under this scheme the Colonial Development Fund is providing £19,000 per annum for five years for sleeping sickness control measures. The four sleeping sickness control officers required to bring the establishment up to full strength were appointed in 1938, and the two Royal Army Medical Corps British Non-Commissioned Officers who were still required arrived in December.

The treatment section of the service has been reorganized, and five complete sleeping sickness teams have been kept in the field during the whole of the year. In June, a sixth team was placed in the field. The constitution of each team is described. The control section of the service has been engaged on work in the sleeping sickness settlement areas in the old Anchau District of Zaria Province. This section has carried out large-scale protective clearing campaigns in the south of the Katsina, and in Zaria, Provinces.

During the year 378,109 people were examined by the sleeping sickness teams, and 21,073 were found to be infected; of these 20,995 had completed treatment at the end of the year. A further 9,661 cases were diagnosed and treated at field dispensaries, and 4,272 at general medical stations. The total cases found during the year were thus 35,006. In addition, 9,016 persons were examined in connexion with the scheme for the control of mines labour in the Southern Division of Plateau Province; 127 cases of sleeping sickness were discovered among these labourers.

Details are given of the work of the treatment teams and dispensaries. The section dealing with sleeping sickness control gives an account of the Anchau Settlement Scheme.

Owing to the greatly increased activities of the department and various other circumstances, little time could be devoted to research, but a certain amount of entomological work and chemotherapeutic research has been done. The senior entomologist gives a brief summary of his work relating to the pupal environment of *G. morsitans* and *G. tachinoides* at Gadau.

The report closes with a short account of the effect of exposing "premunized" animals to fresh infections in a new area. It was found that 21 animals which had survived premunization with *T. vivax* were but little affected by an injection of this parasite, only one animal dying in 12 months, whereas the same dose of *T. vivax* sufficed to kill 8 of 10 clean animals. The next stage in the investigation was to decide whether this resistance to *T. vivax* was due to specific antibodies acquired by the animals during their previous infections or whether it was a resistance inherent in the animals and not acquired artificially. As they had never been exposed to infection with *T. congolense*, 17 of the premunized animals were injected with a dose of pure *T. congolense* from a sheep. At the end of 10 months, it was found that only one death had occurred among the premunized animals, whereas 6 of 10 control animals had died. From this it appears that the premunized cattle possessed a natural, rather than an acquired, resistance to trypanosomal infection. [See also SCHILLING below.]

The final stage in the experiment was to transfer these animals to the middle sleeping sickness belt, in order to determine if they were equally resistant there. The animals arrived at Ilorin in October 1937. On arrival they were in fair condition, but one or two suffered from streptotrichosis, and three died within two months of arrival. Of the remaining eight, one kept well and fit, but seven became infected with trypanosomes. They were treated with tartar emetic, but three of them died. It is noteworthy, however, that three of these animals, including one that died, only broke down when put to work. Thus, of 11 premunized animals, six died within six months of their arrival at Ilorin, four were in bad condition and only one remained well and able to work. The author believes that some outside factor broke down the resistance of the animals. *W. Y.*

Colonial Development Fund Scheme [**for the Control of Sleeping Sickness in the Provinces of Nigeria**]. No. 445.—8 mimeographed pp.

This scheme, the object of which is to control sleeping sickness in Northern Nigeria, has now been in operation for two years. The disease is being controlled in two ways, *viz.*, partly by an improved treatment service financed by the Nigerian Government, and partly by the special control service financed by the Colonial Development Fund. The large decrease in sleeping sickness during the last two or three years has undoubtedly been due more to treatment than to protective measures. The latter have played their part, but as they are directed mainly against the fly it will take longer for their cumulative effect to become apparent.

In 1939, the sleeping sickness teams examined 485,000 people, and 19,855 cases were diagnosed and treated. These figures compare favourably with those of 1935, when 84,364 cases were found among 407,203 people examined. Of 264,000 people examined in areas which had not previously been surveyed, 18,209 cases (6·9 per cent.) were found to be infected. The majority of these were in Benue Province.

The special sleeping sickness dispensaries have helped by continuing treatment after the sleeping sickness team has left the district. About 8,000 cases were treated at these dispensaries in 1939, and the total number treated by the teams, dispensaries and hospitals was about 32,000.

An indication of the beneficial results of mass treatment is given by the population figures for Zaria Emirate. During the years 1923–1933, the number of adult males had fallen by 12 per cent., and there is reason to believe that this decrease was to be correlated directly with the incidence of sleeping sickness. By 1937, the whole population had been examined and about 78,000 cases treated. In 1933, the total population had fallen to 373,195 people, but in 1937 it had increased to 402,257, and to 418,032 in 1939. There is now only a fraction of the old amount of disease.

The work of the control service.—The aim of the control service is to prevent people from being infected by preventing them from being bitten by tsetse. This can be done in two ways: local protective clearings of streams near villages, watering places, cross-roads, etc., so as to reduce the contact between man and fly; and the more drastic form of control, devised with the object of exterminating tsetse

within a territory, of removing the population to a locality where there is no fly. As, except in the far North, there is practically no country which is not infested with tsetse, the aim of sleeping sickness settlement schemes is to make a patch of country completely safe by exterminating the fly and then to move sufficient people into it to allow of its being kept free from tsetse.

Settlement Schemes.—As the surveys of the Eastern districts of Zaria Emirate showed that 20–40 per cent. of the population were infected, it was decided that an attempt should be made to eradicate tsetse in a corridor some 70 miles long by 10 miles wide, and to move the population from the periphery into the area. This fly-free corridor would provide a safe area and would give a valuable fly-free trade route. Neighbouring districts were to be protected by communal clearing campaigns. Very interesting and encouraging details of this settlement scheme are given.

During 1939, 205 miles of streams were cleared at an average cost of £11 15*s.* per mile. Large mahoganies and other high branching timber trees were left wherever possible.

Investigation suggested that an allowance of 4·3 acres per head of population should be made, and last dry season arrangements were completed for the settlement of 34 outlying hamlets into 18 new villages situated in the corridor ; during the rains the people started to clear their new farms. The building of as many villages as possible is now taking place, and most of them have already been provided with cement-lined wells. It is hoped to move about 3,000 people in 1940. Details are given of the general layout of the small hamlets. The main town in the district, Anchau, has been enormously improved.

W. Yorke.

NASH (T. A. M.). **The Effect upon *Glossina* of changing the Climate in the True Habitat by Partial Clearing of Vegetation.**—*Bull. Entom. Res.* 1940. Apr. Vol. 31. Pt. 1. pp. 69–84. With 4 figs. & 2 plates. [10 refs.]

Different species of tsetse fly are known to be adversely affected, to a greater or lesser degree, by high temperatures and low atmospheric humidities. It has been shown possible by partial clearing of islands of forest which normally serve as permanent homes, to alter the climatic conditions so that *Glossina tachinoides* is exterminated during the hot, dry season in Northern Nigeria. This paper describes in detail the amount of clearing necessary to produce a definite change in climate (increase in maximum temperature, increase in saturation deficiency, and decrease in water content of the soil.). The precise relation between these climatic changes and the numbers of the tsetse population is indicated. Another species of tsetse, *G. morsitans*, is more resistant to high temperatures and low humidities, particularly because it selects resting places with favourable micro-climates when these are available, so that complete clearing is necessary for its extermination.

This is an excellent account of a carefully controlled field experiment and important both as an exercise in field ecology and as a piece of practical work of far reaching importance. Incidentally, being based on results of laboratory work, it shows once again the importance of apparently purely academic work in planning measures to control insects.

Kenneth Mellanby.

HARDING (R. D.). **The Influence of Sleeping Sickness on Mortality in Two Districts of Northern Nigeria.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1940. Mar. 20. Vol. 33. No. 5. pp. 483–500. With 1 map.

In this paper the author has attempted to correlate the death rate from all causes with the sleeping sickness incidence in suitably sized groups of two non-adjacent districts in Northern Nigeria. The districts investigated were: first, Igabi District of Zaria Province, an area of some 600 square miles, containing a population of about 14,000; and second, the Kankara District of Katsina Province, covering an area of about 550 square miles and containing a population of 36,000. The position of these districts is shown in a map of Northern Nigeria.

The author summarizes the results of his investigations as follows:—

"The method employed was to obtain data, by methodical questioning of every householder, from which the crude death and other rates could be calculated over a preceding period, and be correlated with the known incidence of sleeping sickness. The figures were worked out village by village, and the villages then combined into groups of sufficient size to make the numbers significant.

"In the first district, Igabi, a close correlation was obtained, the death rate rising from 71·4 per 1,000 with a sleeping sickness incidence of 18·6 per cent., to 104 per 1,000 with a sleeping sickness incidence of 28·6 per cent. In other words an additional death occurred for approximately every additional three people infected. The infantile mortality rate also showed a close correlation with the sleeping sickness incidence. As infants were not found to be infected, this result was unexpected. The reasons for it are discussed. The birth rate showed no definite correlation.

"In the second district, Kankara, no correlation was found to exist, and the conclusion is drawn that, during the period under review, sleeping sickness was not fatal; the patients must either have harboured a mild chronic infection carrying no threat to life, or have been undergoing spontaneous cure.

"The clinical types of the cases found are described. They are similar in the two districts, and would not have been suspected of having so different a prognosis.

"It is pointed out that Igabi lies in the middle of a sleeping sickness belt, and it is suggested that the virulence of the disease in this district may be accounted for by the very free means of communication which exist, and by the movement in the past of large gangs of labour, tending to disseminate many different strains of trypanosome imported from outside. The infection in Kankara, on the other hand, was probably of later, though not very recent, introduction; and as the district is situated on the very edge of the belt and is traversed by no main roads or railways, the possibility of a multiplicity of strains existing is very much less. If this conclusion is correct, it emphasizes the necessity of careful sleeping sickness control measures in areas which may be opened up in the future.

"The mean birth rate found in Igabi was 64·7 per 1,000; and the mean death rate 84·2. The corresponding figures for Kankara were 44·1 and 23·6. The reliability of these figures is discussed."

W. Y.

HAWKING (Frank). **Culture of *Trypanosoma gambiense* in Blood from Normal and Infected Persons.**—*Ann. Trop. Med. & Parasit.* 1940. Apr. 30. Vol. 34. No. 1. pp. 31–34.

During a recent visit paid by the author to Leopoldville, BRUTSAERT and HENRARD showed him their technique for the cultivation of

trypanosomes upon a medium containing human blood [this *Bulletin*, 1938, Vol 35, p. 704] and they told Hawking that they had found that the blood of some individuals was more suitable than that of others.

In the present paper, the author has attempted to investigate whether these differences could be associated with previous exposure to infection by trypanosomes. Owing to limitations of time resulting from the outbreak of war, it was not possible to do more than one experiment. It was found that trypanosomes grew as readily in blood from cases of sleeping sickness as they did in that from normal controls ; hence, there was no evidence by this technique of immunity against a second infection. In one case trypanosomes grew readily in blood containing appreciable quantities of Bayer 205, and in another case a culture was obtained from a patient whose blood showed no trypanosomes during examination of stained thick films.

W. Y.

TARABINI CASTELLANI (G.) & MERIGGI (L.). Studi sulla tripanosomiasi sperimentale da *Castellanella gambiensis* : 1° Sul comportamento del derma di cavia alla inoculazione di tripanosomi sanguicoli. [**An Experimental Study of** *Trypanosoma gambiense*. **1. The Reaction of the Skin of the Guineapig to Intracutaneous Injection of Blood Trypanosomes.**]—*Riv. di Biol. Colon.* Rome. 1939. Dec. Vol. 2. No. 6. pp. 401–411. English summary (3 lines).

The authors have inoculated a number of guineapigs intradermally with *Trypanosoma gambiense* from the blood of an infected guineapig with a view to discovering whether the trypanosomes produced any cutaneous reaction. In three of fifteen animals a slight transitory hyperaemia was produced and nothing more. The trypanosomes inoculated into the skin thus produce no definite lesions.

C. M. Wenyon.

STEINFELD (F. U.). **Attempts to reduce Acquired Atoxyl-Resistance in** *Trypanosoma gambiense*.—*Ann. Trop. Med. & Parasit.* 1940. Apr. 30. Vol. 34. No. 1. pp. 45–51. [15 refs.]

The author quotes the work of the reviewer and others to the effect that arsenic-resistance in trypanosomes, once acquired, appears to be fixed and immutable. All attempts to destroy it have so far been unsuccessful, except those made by CITRON, who claimed to have abolished salvarsan-resistance by sodium thiosulphate. YORKE and his colleagues, however, could not confirm Citron's findings.

In the present work, the author has attempted, by means of various physical and chemical agents, to destroy arsenic-resistance. All his attempts failed, except that he believes he obtained a reduction in the degree of resistance by repeatedly exposing the resistant trypanosomes *in vitro* to a 10 per cent. solution of glucose. He was unable, however, to obtain this result consistently. In some experiments a partial or temporary reduction in resistance was observed, but in most cases no effect was produced. [This work will require confirmation before it can be accepted]. *W. Y.*

JACK (R. W.). **Studies in the Physiology and Behaviour of** *Glossina morsitans*, **Westw.**—*Mem. Dept. Agric. S. Rhodesia.* Salisbury. 1940. No. 1. [Correction 11th March 1940.] 1 p. [Summarized in *Rev. Applied Entom.* Ser. B. 1940. May. Vol. 28. Pt. 5. pp. 81–82.]

"In this correction of a small section of a paper already noticed on *Glossina morsitans*, Westw., in Southern Rhodesia, the author points out that other workers give 3–3½ days for the embryonic period and 4–5 days for the larval period. The first larval instar has been stated to last only a few hours and it has been suggested that the moult to the third instar occurs shortly before the larva is expelled. The author's observations confirmed the fact that the females usually take a large blood meal about 3 days before larviposition and do not feed again before the larva has been deposited. Thus, this meal will normally be taken when the larva is about two days old and presumably in the early part of the second instar and not at the end of this instar or the beginning of the third, as was suggested in the original paper. It is estimated that at this period the larva should measure less than 3 mm. in length. In general, female flies should therefore not be attracted to a host when the larva is in a more advanced stage. In the various tables included in the original paper many small second-instar larvae were classified as first-stage larvae; any larva classified as second-stage measured 2 mm. or more in length.

"Dissection of considerable numbers of females of *G. pallidipes*, Aust., caught on a donkey revealed no higher percentage of females containing larvae in an advanced stage of development than among those caught on man. This emphasises the fact that females are not normally attracted to a host when they are in an advanced stage of pregnancy, although they may be so attracted if they have failed to obtain their pre-larviposition meal at the correct time. Females of *G. morsitans* containing third-instar larvae showing black lobes have been caught feeding on man and animal, but only exceptionally. The capture on man or animal of any considerable proportion of females containing larvae in an advanced stage, far from indicating a thriving fly community, would seem to indicate a lack of sufficient opportunities for feeding." [See this *Bulletin*, 1940, Vol. 37, p. 400.]

RICHARDS (P. W.), TANSLEY (A. G.) & WATT (A. S.). **The Recording of Structure, Life-Form and Flora of Tropical Forest Communities as a Basis for their Classification.**—*Institute Paper No. 19.* Imperial Forestry Institute, University of Oxford. 1939. [1*s*.]

Those who deal with *Glossina* in the field know how closely its biology and distribution are associated with particular types of forest. They also know how difficult it is to describe the types of forest and to arrive at any useful system of nomenclature. Some of the terms in use are based on the prevalent tree, for instance "*Isoberlinia-Brachystegia* association"; others are physical such as flood plain: others again are general, for example, savannah, orchard-bush, or kurimi.

The authors of the present bulletin are botanists, interested in this problem of devising an acceptable, reasonable system of names for different types of woodland in the tropics. They discuss the problem, but put forward no system of names or definitions. They provide an interesting list of forty-two points, which ought to be considered by anyone attempting to describe a type of tropical woodland.

The matter is clearly one for the botanists. It is hoped that the entomologists may as far as possible fall into line. [See also this *Bulletin*, 1939, Vol. 36, p. 665.] *P. A. Buxton.*

YORKE (Warrington). **Recent Work on the Chemotherapy of Protozoal Infections.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1940. Mar. 20. Vol. 33. No. 5. pp. 464–476. [27 refs.]. Discussion pp. 476–482 [EWINS (J. A.), DALE (Henry), KING (H.), HAWKING (F.), CHESTERMAN (C. C.), MURGATROYD (F.), & YORKE (Warrington) (in reply)].

In this address the author summarizes the results of the investigations which followed the discovery of the direct trypanocidal action of synthalin. The work has culminated in the production by Dr. EWINS, of Messrs. May and Baker, of a number of aromatic diamidine compounds, certain of which, particularly 4 : 4′ diamidino stilbene, 4 : 4′ diamidino diphenoxy propane and 4 : 4′ diamidino diphenoxy pentane, have been found to be of great activity in the treatment of a number of protozoal infections of man and stock, especially trypanosomiasis, leishmaniasis and babesiasis. Most of the results recorded in this paper have already been published and noticed in this *Bulletin*. The present address gives rather later information regarding the clinical trials in human trypanosomiasis and leishmaniasis. The author concludes with the following words :—

" The investigations which I have described this afternoon have opened up a fresh field in chemotherapeutic research. New compounds of considerable activity in a number of protozoal infections have been discovered ; whether they will prove of practical value it is as yet impossible to forecast, but the preliminary clinical trials have been sufficiently encouraging to justify the hope that, if we pursue the work—both chemical and biological—to its ultimate conclusion, our labours may not be in vain."

W. Y.

DEVINE (J.). **Studies in Chemotherapy. XXIV.—Changes in the Blood produced by Administration of 4 : 4′-Diamidino Stilbene.**—*Ann. Trop. Med. & Parasit.* 1940. Apr. 30. Vol. 34. No. 1. pp. 67–71.

This note records an examination of the toxic effects in rabbits of 4 : 4′-diamidino stilbene. Tables show the results of blood analyses for sugar and urea of rabbits which had received, respectively, 15 mgm., 25 mgm. and 27·5 mgm. per kilo. In animals which had received the smallest dose, the blood sugar was not significantly affected, but the blood urea rose to some 50–100 per cent. within a few hours and then fell to normal within less than three days.

Of the two animals which had been given 25 mgm. per kilo., one survived and the other died. Both animals showed a marked and rapid rise of almost 100 per cent. in the blood sugar within two hours after injection, with an almost equally rapid fall to normal. There was no further variation or suggestion of hypoglycaemia for a further period of 20 hours. There was no significant change in the blood amino-N level. In each case the blood urea rose rapidly to a maximum within a little more than one day. In the animal which recovered, the figures gradually returned to normal, and in the one which died the blood urea figures remained high until the time of death.

Of the two animals which were given the largest dose, viz., 27·5 mgm. per kilo., one collapsed and died within five minutes, but the other, after an immediate collapse, recovered completely. This animal proved highly resistant to the toxic effects which might be

expected from such a large dose. There was no evidence of hepatic injury, the rise of blood urea was not very great, and there was no increase in blood sugar.

Finally, two rabbits were given 5 mgm. per kilo. of diamidino stilbene on each of six successive days. In these, no significant changes in blood sugar or urea were observed. *W. Y.*

HAWKING (Frank). **Concentration of Bayer 205 (Germanin) in Human Blood and Cerebrospinal Fluid after Treatment.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1940. June 27. Vol. 34. No. 1. pp. 37–52. With 4 figs.

This paper describes an investigation into the concentration of Bayer 205 found in the blood and cerebrospinal fluid of sleeping sickness patients who had been treated with this compound at Kahama in Tanganyika and at Gadau in Nigeria. The method employed was that described by DANGERFIELD, GAUNT and WORMALL [this *Bulletin*, 1938, Vol. 35, p. 714]. The author summarizes his results as follows :—

" 1. By means of the Wormall test, estimations were made on the concentration of Bayer 205 found in the plasma of African sleeping-sickness patients who had been treated with this compound. Big variations were found between one individual and another.

" 2. In persons who had received a single intravenous dose of 1 gramme, the average concentration was about 3 mg. per 100 ml. after two days, and about 0·6 mg. after nine days.

" 3. In persons who received courses of four doses, the concentrations reached depended more upon the individual peculiarities of the patient than upon the spacing of the doses. One day after the fourth dose, the concentration in the blood ranged from 4 to 15 mg. per 100 ml. After courses of five or six doses, Bayer 205 could be demonstrated in the blood of some patients up to eight or nine months later ; in other patients it had disappeared within five months.

" 4. Estimations were made on the cerebrospinal fluid. Although Bayer 205 was present in the plasma of these patients in considerable concentrations, it did not penetrate into the fluid in sufficient amounts to be detected by the chemical test.

" 5. Since individuals vary so greatly in their tendency to retain Bayer 205 in their blood, it is strongly recommended that the treatment of European cases of sleeping-sickness be controlled by chemical estimations."

W. Y.

DUBOIS (A.) & KOHN (I.). A propos du mécanisme d'action du Bayer 205 sur les trypanosomes. [**The Mechanism of the Action of Bayer 205 on Trypanosomes.**]—*Ann. Soc. Belge de Méd. Trop.* 1940. Mar. 31. Vol. 20. No. 1. pp. 51–56.

In giving a brief summary of previous work on this subject, the authors draw attention to the observation of the reviewer and his colleagues that the trypanocidal action of Bayer 205 is practically nil *in vitro* within 24 hours, and that of JANCSÓ that it is but slight after 48 hours. Jancsó explained the fact that Bayer 205 sterilizes a mouse in 24 hours on the hypothesis that the drug opsonizes the

parasites, which are then destroyed by phagocytes in the living animal.

The experiments recorded in the present communication do not support Jancsó's hypothesis. Heavily infected mice or guineapigs were treated with moderate doses of Bayer 205 and bled 12 to 14 hours later. The trypanosomes—separated by centrifugation and washed in saline—were injected intravenously into a series of mice, some of which were normal and in others of which the reticulo-endothelium had been blocked by electrocolloidal copper, together with (in some cases) splenectomy. Whilst trypanosomes were always at first discovered in the injected animals' blood in considerable numbers (1–20 per field), those obtained from normal untreated animals continued to multiply rapidly, but those obtained from treated animals failed to multiply and disappeared completely in the course of 24–48 hours, whether the reticulo-endothelium of the injected animal had been " blocked " or not.

From this work Dubois and Kohn conclude that the trypanosomes in the treated animals had fixed a toxic dose of the product and that the integrity of the reticulo-endothelium is not necessary to cause their disappearance from the blood of the animal into which they were injected. In further experiments, the authors were unable to confirm Jancsó's statement that Bayer 205 caused the disappearance of trypanosomes from the blood more quickly in intact animals than in animals in which the reticulo-endothelium had been blocked. *W. Y.*

KLEINE (F. K.) & KUNERT (Herbert). Das Verhalten des menschlichen Schlafkrankheitserregers im Rind. [**The Behaviour of Human Sleeping Sickness Parasites in Cattle.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1939. Oct. Vol. 43. No. 10. pp. 451–453.

The authors begin by pointing out that Bayer 205 is of little value in tsetse disease of cattle, whereas antimony preparations, which are of great value in the treatment of trypanosomiasis in cattle, are of little value in human sleeping sickness. There seem to be two possible explanations of this : the first is that the drug does not act directly on the parasite, but in some way or other is changed in the body of the host ; and the second is that the response of the different parasites to the drug varies. Thus man is infected with *T. gambiense* and *T. rhodesiense*, whilst cattle are infected with *T. vivax*, *T. brucei* and *T. congolense.*

With a view to examining the problem, the authors infected 10 calves, each of about 80 kgm. in weight, with six different strains of *T. rhodesiense.* Four of these calves were treated with a single intravenous injection of 5 gm. of Bayer 205, two calves received two such injections, one calf four injections, and the remaining three served as controls.

The results of these experiments are set out in detail. It appears that all the treated calves were immediately cured. The three controls continued to harbour trypanosomes in the blood for between 7 and 9 months, but parasites were scanty and the animals remained in good condition. *W. Y.*

VAN HOOF (F.), HENRARD (C.) & PEEL (E.). Observations sur l'efficacité du "Bayer 205" contre le *Trypanosoma gambiense.* I. Durée de la protection conférée par une dose moyenne. Effets secondaires du "Bayer 205" sur le pouvoir pathogène des trypanosomes. [**Observations on the Efficacy of "Bayer 205" against** *T. gambiense.* **I. Duration of the Protection conferred by a Moderate Dose. Secondary Effects of "Bayer 205" on the Pathogenic Power of Trypanosomes.**]—*Ann. Soc. Belge de Méd. Trop.* 1940. Mar. 31. Vol. 20. No. 1. pp. 105–116. [16 refs.]

——, —— & ——. II. Action combinée de la germanine préventive et de l'antigène "trypanosome." [**Combined Action of Preventive Germanin and of Trypanosome Antigen.**]—*Ibid.* pp. 117–122.

——, —— & ——. III. Action combinée du "Bayer 205" et des trypanosomes sur des animaux guéris. [**Combined Action of Bayer 205 and of Trypanosomes in the Cured Animal.**]—*Ibid.* pp. 123–128.

——, —— & ——. IV. Modifications de l'évolution de la trypanosomiase provoquées par le Bayer 205. [**Modifications of the Evolution of Trypanosomiasis produced by Bayer 205.**]—*Ibid.* pp. 129–135.

I. The authors refer briefly to previous work on the value of Germanin as a prophylactic against trypanosomal infection, and especially to the observations of DUKE, who found that a dose of 2 gm. of Bayer 205 protected human beings against infection with *T. gambiense* and *T. rhodesiense* for at least 3 months, and that 1 gm. protected them for at least 73 to 92 days [this *Bulletin,* 1936, Vol. 33, p. 657].

In the present paper the authors have examined the protection against strains of *T. gambiense* from the Belgian Congo conferred on guineapigs by a dose of Bayer 205 varying from 0·015 gm. to 0·03 gm. per kilo. The test consisted in subjecting the treated animals at various intervals after treatment to the bite of a single infective tsetse. The results of a long series of observations are summarized in a table, from which the authors conclude that a dose of 0·025 gm. of Bayer 205 per kilo. protects a guineapig for at least 58 days, and that probably the average animal is protected for about 100 days.

The next part of the paper is concerned with the question whether feeding the infective tsetse on guineapigs which had received Bayer 205 in any way affected the infection in the fly. The various observations are discussed in detail. In no case did subsequent dissection of the individual tsetse give any evidence that the infection in the gut or glands had been influenced. Earlier work in which infective fly had been fed on recently injected animals gave a similar result, but also brought out the fact that a percentage of the fly so fed apparently lost the power of infecting normal animals. The present observations, which relate to animals injected with Bayer 205 a long time previously, do not bring out the second point so clearly, but the authors show that of the 11 guineapigs bitten before the fly had fed on an animal which had received Bayer 205 ten became infected, whilst of the 19 animals bitten after this feed only 14 became infected.

II. Duke has recorded that a volunteer who had received 1 gm. of Bayer 205 and was then exposed to a long series of bites by infective tsetse remained immune for the exceptionally long period of 327 days. Duke explained this phenomenon on the hypothesis that the liberation of antigen from trypanosomes destroyed by the drug provoked the

formation of immune-body, thereby contributing to the immunity produced by the drug itself [this *Bulletin*, 1936, Vol. 33, p. 657].

The present authors examined the subject in the case of guineapigs given a prophylactic dose of the drug and subsequently subjected to the bites of infective Glossina. They were unable to obtain any definite support for Duke's hypothesis.

III. In this paper the authors consider the question whether infected guineapigs cured by a dose of 0·025 gm. of Bayer 205 are protected against reinfection for a longer period than are normal guineapigs which have received this dose of the drug. Details of the experiments are summarized in a table. One guineapig was protected for only 70 days, one for about a year and the remaining three animals for about 200 days; two monkeys similarly treated both became infected when subjected to the bites of infective tsetse about 100 days later. In another series of experiments, 5 guineapigs were treated in the same way, and their resistance to reinfection was tested after various periods, by inoculation of infected blood instead of by the bites of infective tsetse; most of the animals were found to be susceptible in about 100 days. From this work the authors conclude that the relative immunity of cured animals, although it may exist, manifests itself only in a small number of individuals and is transient.

It is noted that the trypanosomes which were successfully reintroduced after variable intervals into the cured animals retained their power of evolution in Glossina, *e.g.*, one guineapig reinfected 200 days after cure was bitten by 130 clean Glossina and 14 of these became infected.

IV. There seems no doubt that Bayer 205 is a prophylactic of the first order, and it was hoped that by the use of the drug it might be possible to destroy the human reservoir of the virus in a limited region for a period sufficiently long for the development of a clean stock of tsetse. But this hope has not been realized for various reasons, viz., the duration of protection was shorter than the life of the fly; the virus was introduced from surrounding districts and perhaps from animals, especially pigs; and probably certain natives escaped the prophylactic dose.

In a previous note it has been shown that a dose of 0·025 gm. per kilo. may not protect longer than 58 days; increasing the dose or the administration of a second dose at a week's interval does not materially improve things.

In infected animals and man it has been frequently observed that, when a cure is not obtained, the trypanosomes may become so scanty as to escape observation, and nevertheless are capable of infecting Glossina. One of the late results of massive prophylactic injection with Bayer 205 in an endemic area is that the appearance of the endemic seems to have changed, in that among the cases the proportion of those in the advanced stage is increased; illustrations are given. It is, however, necessary to keep in mind that cryptic or inapparent infections may occur naturally in the absence of such prophylaxis.

From all this work the authors reach certain definite conclusions :—

1. In order to avoid the danger of masking the evolution of the disease, the whole population should first of all be carefully examined and the infected treated.

2. The optimum prophylactic dose is probably 0·025 gm. per kilo. (1·25 to 1·5 gm. for an adult of 50 to 60 kilo.). The dose should be repeated after three months.

3. Particular care should be taken at the end of the 3 months, when the second dose is being given, to discover cases of infection.

4. Reasons are given why it is desirable to repeat the prophylactic injections at three-monthly intervals. *W. Y.*

VAN DEN BRANDEN (F.). Giftigheidsproef van Germanine (Bayer 205) en gelijksoortige producten (309 Fourneau of Moranyl, Belganyl). [**Toxicity Tests in the Case of Germanin and Allied Products.**]—*Ann. Soc. Belge de Méd. Trop.* 1940. Mar. 31. Vol. 20. No. 1. pp. 91–92.

The author lays down that if 5 mice of 20 gm. weight be injected intravenously (and slowly) with a 5 per cent. solution of Germanin, or allied compound, in doubly distilled water in a dose of 0·40 gm. per kilo., not more than two of the animals should be dead within 6 days. *W. Y.*

SICÉ (A.). La prophylaxie de la trypanosomiase humaine et le traitement des trypanosomés au Soudan français. [**The Prophylaxis and Treatment of Human Trypanosomiasis in French Sudan.**]—*Ann. de Méd. et de Pharm. Colon.* 1939. Oct.–Nov.–Dec. Vol. 37. No. 4. pp. 879–918.

Sleeping sickness occurs over a large band of the Southern portion of French Sudan. The area of greatest endemicity is along the Bani and its tributaries, which constitute the seasonal haunts of the fly. Other areas infected are South of Bamako, along the Niger and its tributaries, and certain tributaries of the Senegal [this *Bulletin*, 1940, Vol. 37, p. 9]. Details are given in a series of tables of the incidence of the disease in various parts of the colony.

In a previous paper, the author and TORRÉSI [this *Bulletin*, 1939, Vol. 36, p. 669] have referred to the effect of synergic treatment in cases of sleeping sickness in French Sudan. As a rule, blood and gland infections were treated with tartar emetic and atoxyl, whilst in cases showing signs of meningeal involvement the combination moranyl-tryparsamide was used. In the present paper, Sicé gives details of a considerable number of cases treated in this manner at the sleeping sickness centre at San.

The author first deals with a series of 36 cases in the meningo-encephalitic stage of the disease; these patients were treated synergically with tartar emetic and tryparsamide. In all, the cerebrospinal fluid was considerably changed when treatment commenced, and after treatment it had become normal, or almost so, in all cases except one. Details are given regarding two very severe cases which terminated fatally.

Another group of patients treated in this way were 37 cases exhibiting a simple cellular reaction in the cerebrospinal fluid; all did well. A third group consisted of 22 patients in an early stage; here again all did well.

The paper terminates with an account of similar treatments at another sleeping sickness centre at Ségou. *W. Y.*

KOPP (Israel) & SOLOMON (Harry C.). **The Untoward Reactions of Tryparsamide.**—*Amer. Jl. Syph.* 1940. May. Vol. 24. No. 3. pp. 265–283. With 3 figs. [23 refs.]

The authors state that, although tryparsamide has been in general use for 16 years, little discussion has appeared concerning its untoward

manifestations or toxic reactions, apart from its effect on the visual apparatus. In the present paper they give an account of the toxic manifestations observed by them in the period 1923–1939, during which they have given 43,308 injections to 829 patients. The average dose administered has been approximately 3 gm., and continuous courses of treatment year after year have been given.

The complications due to the use of tryparsamide may be divided arbitrarily as follows :—

" I. Visual
  1. Optic atrophy
  2. Toxic amblyopia
" II. Nitritoid or allergic
" III. Gastrointestinal
  1. Nausea, vomiting, diarrhoea, cramps
  2. Jaundice
" IV. Skin
  1. Dermatitis
  2. Urticaria
  3. Pruritus
" V. Cerebral
  1. Headache, dizziness, drowsiness, confusion, coma, aphasia
  2. Convulsions
  3. Mental symptoms : emotional instability, hallucinosis
" VI. Other nervous system symptoms
  1. Peripheral neuritis (?), lancinating pains, loss of bladder control
" VII. Other types
  1. Chills, fever, tingling in the extremities, weakness."

It is not possible to classify some reactions in any one category, as there may be a mixture of signs, such as gastrointestinal disturbances followed by skin lesions or a nitritoid reaction with urticaria. The yearly number of untoward reactions in the authors' series of cases varied from 4 to 29 per 1,000 injections.

Visual disturbances.—These are already well known, and nearly all observers agree that they are most apt to occur during the first 8 to 12 injections of the drug. In the literature these disturbances have been grouped under two headings : (*a*) subjective and (*b*) objective. The incidence of visual disturbances in the authors' cases was 4·5 per cent., and the incidence of optic atrophy 1·2 per cent. Both values are low when compared with others in the literature. The type of syphilitic lesion present in the patient may play some part in the development of optic atrophy. Thus, of 17 patients with general paresis who developed visual disturbance, optic atrophy resulted in only 4 (24 per cent.), whereas of 14 patients with tabes dorsalis and taboparesis optic atrophy developed in 6 (43 per cent.). Six patients with meningovascular syphilis developed no permanent damage.

The authors' findings bear out the fact that, when visual disturbances occur during the first 10 injections of tryparsamide, the drug should be permanently omitted. In 13 patients in whom the drug was continued at this time, optic atrophy resulted in 6 patients (46 per cent.), whereas in 16 patients in whom the drug was immediately omitted, optic atrophy resulted in only 3 cases (19 per cent.). When, however, visual disturbance occurred after the administration of 17 to 61 injections, optic atrophy did not result, even though tryparsamide was continued in 6 of 7 patients, and as many as 194 injections were given to 1 patient.

The subjective complaints of the patients consisted of blurring and haziness of vision, "spots before the eyes," "eyes went blind," and "cloud over eyes." No lesions were discoverable in the fundus in most cases at the time of their complaints, and perimetric examination showed either no change or some concentric or quadrantal constriction. The central vision acuity in most was normal and in a few diminished. Patients with visual complaints are not very apt to experience other types of reactions, probably because the drug has been administered for only a short period and is in most cases immediately stopped after the visual complaint.

Nitritoid or allergic reactions.—During the first five years, only one patient experienced repeated nitritoid reactions, but since 1928 nitritoid reactions have occurred in each year, with the exception of 1932. From 1922 to 1937 the incidence of nitritoid reactions ranged from 0 to 3 per cent. These reactions usually appeared in patients who had shown other manifestations of sensitivity, especially the gastrointestinal type of reaction. They were most apt to occur in those who had received considerable quantities of tryparsamide. The reaction occurred in the course of the first 10 injections in only 7 of the 41 patients who exhibited it, and 31 of the patients had received more than 30 injections before they developed the reaction. The reactions varied from mild to very serious. Some patients recovered within 20 to 30 minutes without the use of adrenalin, but in others repeated doses of adrenalin were required.

Gastrointestinal reactions.—This type of reaction is the most common experienced by patients sensitive to tryparsamide, and was seen in 7 per cent. of 829 patients treated at the authors' clinic. It usually occurs from 1 to 4 hours after the injection of the drug, but may occur immediately. It consists of nausea, vomiting, diarrhoea and abdominal cramps, occasionally accompanied by profuse perspiration, pallor of the skin, tingling in the finger tips, suffusion of the face, emotional changes such as apprehension and weeping, dizziness, weakness, chills and fever.

Jaundice.—This is usually of the benign type, brief in duration, with little symptomatology and no sequelae. Of 30 instances occurring amongst the authors' patients, 10 developed during the first 10 injections of the drug, and 24 during the first 25 injections.

Skin.—These lesions have consisted in discrete or multiple desquamative patches on an erythematous base, red blotchy papules, and small purpuric-like areas. When the drug was stopped, they disappeared, except in one case in which residual pigmented areas resulted. Urticarial lesions were observed in 5 patients.

Cerebral.—Dizziness occasionally occurs immediately or shortly after an injection of tryparsamide; it may be accompanied by nausea, vomiting or weakness. Coma with a rise of temperature was seen in one patient. Convulsive seizures occurred in 4 patients immediately after the injection. In 3 patients an acute hallucinosis in the auditory or visual spheres, accompanied by considerable hyperactivity and excitement, followed the injection. A number of patients exhibited emotional disturbances. In some patients with tabes dorsalis, exacerbation of the lancinating pains occurred. In 3 patients foot-drop was observed during the tryparsamide therapy. Tremors of the facial muscles and of the fingers may be exaggerated; in a few patients there was a temporary loss of bladder control, and tingling of the fingers and toes was also seen. *W. Y.*

KOLMER (John A.), KAST (Clara C.) & RULE (Anna M.). **The Spirocheticidal, Trypanocidal, and Mechanism of Activity of Organic Arsenical Compounds in Vitro and in Vivo in Relation to Therapeutic Effectiveness.**—*Amer. Jl. Syph.* 1940. Mar. Vol. 24. No. 2. pp. 201–222. [22 refs.]

The authors commence by reviewing briefly previous work on the spirochaeticidal activity of the arsphenamines *in vitro*. It had been suggested that immobilization *in vitro* might offer an inexpensive method for testing the therapeutic activity of each new lot of arsphenamine and especially neoarsphenamine before being issued for the treatment of syphilis. The primary purpose of the present investigation was to determine whether or not this was possible with both spirochaeticidal and trypanocidal tests.

It was found that variable factors referable to serum, tissue extractives, temperature and time of exposure and number of spirochaetes exposed to the immobilizing and spirochaeticidal effects of arsenical compounds *in vitro*, render these tests unsuitable as a measure of therapeutic effectiveness. A much closer relationship was found between immobilization of *Trypanosoma equiperdum in vitro* and curative effects *in vivo*.

The mechanism of the spirochaeticidal and trypanocidal activity of the organic arsenical compounds is discussed, but the authors were unable to reach any definite conclusion. [It seems to the reviewer that, in so far as the work on trypanosomes at least is concerned, the technique employed by the authors is such as to make it almost impossible to draw conclusions from it. It is a remarkable fact that the authors have apparently overlooked the work of the reviewer and of many others on this subject, all of which has been repeatedly referred to in this *Bulletin*.] *W.Y.*

BROOM (J. C.) & BROWN (H. C.). **Studies in Trypanosomiasis. IV.—Notes on the Serological Characters of** *Trypanosoma brucei* **after Cyclical Development in** *Glossina morsitans*.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1940. June 27. Vol. 34. No. 1. pp. 53–64. [16 refs.]

Early investigators of the serological reactions of trypanosomes have been impressed by the ability of these organisms to produce an apparently unending series of serological types during the course of experimental infections in animals. Generally speaking, these studies were carried out with old laboratory strains of trypanosomes which had been maintained for prolonged periods by direct passage in animals. In some cases, the strains had almost certainly lost the power of cyclical development in tsetse, and possessed a much enhanced pathogenicity for small laboratory animals. There can, of course, be no question of this innate power of trypanosomes for serological variation, but some of the methods employed to evoke it, such as the administration of subcurative doses of drugs, introduce a number of extraneous, uncontrolled factors which make it very difficult to evaluate the results obtained. The experiments of YORKE *et al.*, for example, showed that it was possible to produce drug-resistant strains of trypanosomes by the action of drugs, even *in vitro*.

In the present work, the problem of variation was studied from a different angle and attempts were made to parallel, as far as possible,

the conditions of primary infection in nature, instead of those of long-continued disease. The original strains, from which various substrains, serological types and variants of different electric charge have been derived, were three in number, *viz.*, (1) *T. brucei* G. C., isolated from a naturally infected horse in the Gold Coast into a guinea-pig; the second-passage guineapigs were received in London in April 1940. (2) *T. brucei*, P. T., also isolated from a naturally infected horse in the Gold Coast into a guineapig; the first-passage guineapig was received in London in September 1938. (3) *T. brucei*, B. V., isolated from a native dog in Uganda into a guineapig, from which rats were inoculated; second-passage rats were received in August 1939. The authors maintained all these strains by syringe passage in rats.

In the experiments recorded in this paper, small laboratory animals were infected with one of the derivatives of these recently isolated strains. *G. morsitans*, obtained from pupae sent regularly from Tanganyika, were fed on these animals on a single occasion, and were dissected after an appropriate interval. The salivary glands of infected flies were inoculated into young rats. Each of the cyclical substrains so obtained was compared serologically with the others, and also with the original strains on which the flies had fed, by means of the red cell adhesion test. Unfortunately, owing to the discontinuance of the supply of Glossina pupae, the work had to be stopped prematurely.

The authors summarize their results as follows :—

"1. Experiments were undertaken to study the effect of cyclical development in *Glossina morsitans* on the serological characters of *Trypanosoma brucei*.

"2. In general, the "cyclical substrains" which result from this method of passage resemble each other closely irrespective of the serological type of the strain on which the flies were fed.

"3. This is true only of the derivatives of a single original strain. The cyclical substrains of different original strains are serologically distinct.

"4. In spite of the general similarity within the limits of a single strain, there are certain differences in detailed serological reactions. Examples of these are given and their import discussed.

"5. A strain of *T. brucei* was successfully cultivated in developing hens' eggs. The serological type of the trypanosomes was changed in an irregular manner during the process."

W. Y.

SCHILLING (Claus). Versuche zur Schutzimpfung gegen Tsetsekrankheit. VIII. Mitteilung. [**Experiments on Prophylactic Inoculation against Tsetse Disease. 8th Communication.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1939. Oct. 2. Vol. 96. No. 5/6. pp. 521–522.

In this note the author records the final results of experiments which he performed in Tanganyika in 1933–1935. The experiments consisted in the inoculation of newly born calves with minute numbers of trypanosomes which were below the threshold of infectivity; for *T. congolense* this is about 40 parasites. The number of trypanosomes was gradually increased in later inoculations until the parasite appeared in the blood and the animals developed a minimal infection. They became ill and about 30 per cent. died. In 1934 the surviving 11 animals were taken into a tsetse area. On May 1st 1939 the author

received a report giving the fate of these 11 animals. It appears that 6 (54 per cent.) were still alive; of the 13 control animals, only 1 (7 per cent.) survived. The author believes that this technique is capable of improvement, as he probably introduced the animals into the tsetse area too early.

The other method by which he attempted to produce immunity consisted in the inoculation of dried dead trypanosomes. The results were not so good, as only 2 of the 9 animals so treated survived.

The report which Schilling received on May 1st from Tanganyika contains other interesting information. It appears that the immunized animals had 13 calves. Three of these calves were used for other purposes and of 4 others there is no information, but the remaining 6 grew up in the tsetse area and flourished. It would seem, therefore, that the offspring of immune mothers exhibit a certain resistance which enables them to survive in tsetse-infested regions. [See also this *Bulletin*, 1935, Vol. 32, p. 714; 1936, Vol. 33, p. 664; 1937, Vol. 34, pp. 125, 554.] *W. Y.*

HOARE (Cecil A.). **Studies on the Behaviour of *Trypanosoma evansi* in Tsetse-Flies with Special Reference to its Phylogeny.**—*Parasitology*. 1940. Apr. Vol. 32. No. 1. pp. 105–121. With 1 map. [36 refs.]

The author summarizes his studies on *Trypanosoma evansi* as follows:—

"In view of the morphological similarity of *T. evansi* and *T. brucei*, including the sporadic occurrence of marked polymorphism in the first-named species, the hypothesis is advanced that *T. evansi* may have originated from *T. brucei*, by the introduction of the last-named species into localities free of *Glossina* and its subsequent propagation by direct passages.

"The possibility of contact between the mammalian host of *T. evansi*, on the one hand, and *Glossina* and tsetse-borne trypanosomiases, on the other, is shown to exist in the Anglo-Egyptian Sudan, thus pointing to the source from which *T. evansi* in that country may have originated and providing circumstantial evidence in support of the hypothesis.

"Attempts were made to discover whether *T. evansi* is capable of developing in *Glossina*. A total of 568 flies were fed on infected mice and examined at periods from 6 hr. to a fortnight following the infective feed. The results were entirely negative: not only is the trypanosome incapable of establishing an infection in the fly, but the majority of flagellates perish and are digested during the first hours after ingestion by the insect.

"The behaviour of *T. evansi* in tsetse is shown to be similar to that of non-transmissible strains of trypanosomes of the *brucei* group after prolonged maintenance by direct passages in the mammalian hosts, and is therefore also in keeping with the hypothesis." *W. Y.*

KLIGLER (I. J.), OLITZKI (L.) & KLIGLER (Helen). **The Antigenic Composition and Immunizing Properties of Trypanosomes.**—*Jl. Immunology*. 1940. Apr. Vol. 38. No. 4. pp. 317–331.

In a previous paper the authors have reported the results of analysis of the antigenic composition of *Trypanosoma evansi* [this *Bulletin*, 1937, Vol. 34, p. 132]. In the present paper these studies have been extended, and, for purposes of comparison, antigenic analyses have also been

made of the non-pathogenic *T. lewisi*. The technique adopted was the same as that described in the previous paper. The authors summarize their results as follows :—

" Data are presented on the antigenic composition of *Tr. evansi* and *Tr. lewisi* and on the toxic and immunogenic properties of the various components of the cell.

" *Tr. evansi* has a higher lipoid and lower residue content than *Tr. lewisi*.

" The lipoid and protein fractions when injected into animals produce a leucocytosis and a rise in temperature.

" None of the fractions on injection produces a hypoglycaemia or a depression of temperature as is the case with toxic fractions from bacterial cells.

" The various antigenic fractions of *Tr. evansi* fail to induce any immunity in rats.

" The residue of *Tr. lewisi* possesses some immunizing properties ; this is not the case in *Tr. evansi*.

" Injection of whole, dead trypanosomes (*Tr. evansi*) produces a partial and transient immunity.

" Treatment with a drug of an active infection of *Tr. evansi* results in a more solid and durable immunity against a reinfection with the homologous strain ; this immunity is extremely variable in individual rats, in some lasting 2 or 3 months and in exceptional instances as long as 9 months.

" The significance of the cell composition in relation to the antigenic and pathogenic properties of the parasite is discussed and a comparison made with the acid-fast bacteria also having a high lipoid content."

W. Y.

STONE (Wm. S.) & THOMPSON (Arvo T.). **A Method for preserving** *Trypanosoma equiperdum.—Science.* 1940. Apr. 5. Vol. 91. No. 2362. p. 344.

A method is described whereby *Trypanosoma equiperdum* has been kept viable and infective for a period of 14 months by freezing infected rat blood. The procedure was briefly as follows : Infected rat blood was citrated or defibrinated, and about 5 cc. introduced into a 50 cc. sterile Pyrex vial. The vial was stoppered with a rubber bung, through which a glass rod one foot long had been passed. The vial was then lowered into a freezing bath of dry ice and alcohol and rapidly twirled, during and after submersion, by rolling the glass rod between the palms of the hands. The blood froze almost instantaneously in the bottom of the vial. The bung and rod were removed and replaced by a new sterile aproned rubber cork, the apron of the cork being turned down and securely fastened with rubber bands. The vial was then allowed to submerge in the dry-ice alcohol bath.

The bath used was a wide-mouthed thermos bottle of five gallons' capacity, into which two gallons of ethyl alcohol and twenty pounds of dry ice had been placed. Additions of dry ice were made once or twice weekly to maintain the bath.

The viability of the trypanosomes was tested after 46 days and after 14 months, by removing the vials from the dry-ice bath and allowing the contents to thaw, either at room temperature or by submersion in cold tap water. The blood, when thawed, was haemolysed, but actively motile trypanosomes were present, and on inoculation into young rats they produced fatal infections. *W. Y.*

DIAS (Emmanuel). **The Genus Schizotrypanum Chagas, 1909.**—*Mem. Inst. Oswaldo Cruz.* 1939. Vol. 34. No. 2. pp. 213–227. [Portuguese version pp. 193–211. (53 refs.)]

The genus *Schizotrypanum* was established by CHAGAS in 1909 for the trypanosome of S. American human trypanosomiasis because he was of the opinion that the parasite reproduced by schizogony. When this was disproved he abandoned the new genus for *Trypanosoma*. As the real method of reproduction of this trypanosome is exclusively by the simple binary fission of intra-cellular leishmania forms which eventually become transformed into trypanosomes again, the author is of the opinion that there is still justification for a distinct genus for which CHAGAS' original name must be employed. HOARE maintains that some other trypanosomes, like *T. lewisi*, may also reproduce in the same way but not so exclusively as the one under discussion, while other trypanosomes reproduce only in the trypanosome form. The author of the paper admits this but argues that no other trypanosome is without a reproductive trypanosome stage, hence his wish to retain the genus *Schizotrypanum*. It seems that this is one of those questions which cannot be settled by argument alone and might be the subject of a ruling by the Committee of Zoological Nomenclature. Fortunately, however, little confusion arises, for both the names *Schizotrypanum cruzi* and *Trypanosoma cruzi* are readily understood to refer to the one trypanosome of S. America. *C. M. Wenyon.*

MAZZOTTI (Luis). **Variations in Virulence for Mice and Guinea Pigs in Strains of *Trypanosoma cruzi* Chagas from Different Species of Bugs (Triatomidae) from Different Localities in Mexico.**—*Amer. Jl. Hyg.* 1940. May. Vol. 31. No. 3. Sect. C. pp. 67–85. With 1 fig. [16 refs.]

The author observed that inoculation of mice and guineapigs with *T. cruzi* obtained from different species of Triatomidae gave different results, which apparently depended in some cases on the species of bug from which the trypanosomes were obtained. He also noticed that strains differing in virulence were obtained from the same species of bug collected in different localities. Apparently there are in Mexico seven or more strains of *T. cruzi* varying in virulence.

Variations in virulence may be due to the frequent passage of trypanosomes from the bugs to mammalian hosts and *vice versa*. Small species of Triatomidae are better adapted for life in human dwellings than are large species, and have more opportunity for feeding on man and domestic animals and thus for transferring trypanosomes repeatedly. It is also possible that the number of bugs in a locality may be a factor in the maintenance of a high degree of virulence.

W. Y.

MAZZOTTI (Luis). **Effects of inoculating Small and Large Numbers of *Trypanosoma cruzi* into Mice.**—*Amer. Jl. Hyg.* 1940. May. Vol. 31. No. 3. Sect. C. pp. 86–91.

The experiments described in this paper were devised with the object of ascertaining the effects of inoculating small and large numbers of *T. cruzi* into mice. In the first experiment, trypanosomes were taken from the digestive tube of *Triatoma barberi*, and, in the second, from

mice experimentally infected with trypanosomes from *Triatoma pallidipennis*.

The experiments showed that inoculation of mice with trypanosomes from the intestinal contents of Triatoma, in varying numbers from 8 to 8,000 parasites, did not produce correspondingly variable results in the animals. The inoculation of mice with small and large numbers of trypanosomes from the blood of infected mice (from 46 to 500,000 trypanosomes) gave more marked effects in the mice receiving the larger doses, but the results were not always constant. *W. Y.*

MAZZOTTI (Luis). Infección natural por *Trypanosoma cruzi* en otras dos especies de triatomas. [**Natural Infection of Two More Species of Triatoma by** *T. cruzi*.]—*Rev. Inst. de Salubridad y Enfermedades Trop.* Mexico. 1939. Nov. Vol. 1. No. 1. pp. 73–78. With 2 figs. English summary (4 lines).

In 1936 the author found a Triatoma in Tututepec, Oaxaca State, infected by *T. cruzi*, which was identified as *T. phyllosoma*; later others, *viz.*, *T. pallidipennis*, *T. dimidiata* and *R. prolixus*, were found naturally infected. He now records two others found infected in nature, one being *T. rubida*; the other at first was thought to be the same but investigation revealed certain differences and it is said to be a new species (not yet named). Up to the present, therefore, there are five species of Triatoma and one of Rhodnius found naturally infected in the district. *H. H. S.*

MAZZOTTI (Luis). Triatomideos de Mexico y su infección natural por *Trypanosoma cruzi* Chagas. [**Mexican Triatomidae Infected in Nature by** *T. cruzi*.]—*Medicina*. Mexico. 1940. Feb. 25. Vol. 20. No. 358. pp. 95–109. With 1 map & 4 figs. [21 refs.] English summary.

The author gives an account of his investigations into the species of Triatomidae found in Mexico and into their natural infection with *T. cruzi*. He gives a list of 15 species, the localities in which they have been found, and which were infected. The majority were found on the Pacific slope, few on the Gulf coast with its damper climate. South of Chiapas *T. dimidiata* is the only species so far found. *Dipetalogaster maximus* (formerly *Triatoma maxima*) and *T. incrassata* occurred in sylvatic districts, all the others were obtained in bedrooms or in courtyards of houses. *T. phyllosoma* occurred also in the nests of field rats. Nine of the fifteen species found proved to be naturally infected; these nine are: *T. phyllosoma*, *T. pallidipennis*, *T. rubida*, *T. barberi*, *T. dimidiata*, *R. prolixus*, *T. picturata*, *T. longipennis* and *D. maximus*. The last three of these are newly discovered vectors. A line map accompanies the article denoting the localities in which the different species are distributed. *H. H. S.*

LENT (Herman). Sobre o hematofagismo da *Clerada apicicornis* e outros artropodos; sua importancia na transmissão da doença de Chagas. [**On** *Clerada apicicornis* **as a Blood-sucking Insect; its Importance as a Vector of** *T. cruzi*.]—*Mem. Inst. Oswaldo Cruz.* 1939. Vol. 34. No. 4. pp. 583–606. With 4 figs. [Bibliography.]

Clerada apicicornis is under natural conditions phytophagous, but in unusual circumstances may suck blood. Among such circumstances

are mentioned the stimulus of artificial light, attractive qualities of the sweat, and hunger. Specimens have been found, in a bed for example, engorged with blood. Experimentally, it has been shown to be infectible with *T. cruzi*, and 72 hours after an infective meal it has been seen to contain metacyclic and crithidial forms. The article contains a useful list of 28 Triatomidae found naturally infected with the trypanosome, and the first describer and the country in which it occurs; a second list of 42 insects, bugs, ticks, etc., which have been demonstrated to be capable of infection experimentally. [It will be interesting to note in course of time whether any of the second list come to be transferred to the first (see also this *Bulletin*, 1939, Vol. 36, p. 754).] *H. H. S.*

GALLARDO (Vicente P.). **Observations on the Sting of *Triatoma rubrofasciata* de Geer.**—*Jl. Philippine Med. Assoc.* 1940. Jan. Vol. 20. No. 1. pp. 35–36. With 1 fig.

Triatoma rubrofasciata is usually found on the back of plant leaves near a house, and in dark corners or under the beds inside a house; it is nocturnal and usually regarded as harmless, and it is not suspected of causing harm because it bites while the subject is asleep and disappears again before daybreak. The patient on waking complains of burning pain in some exposed part—arms, legs, cheeks—not severe, and a circular swelling from 3 to 10 cm. in diameter is seen with a single small papule or vesicle at the centre. Some persons, the more susceptible, complain also of urticaria and pruritus, with malaise but no fever. In children the symptoms may be more alarming, with fever, restlessness and more extensive swelling resembling erysipelas, but they clear up in less than 24 hours. Rubbing of ordinary washing soap on the swelling brings speedy relief [*i.e.* local application of alkali ?], or for the more susceptible injection [amount not stated] of 10 per cent. calcium gluconate. *H. H. S.*

MAZZA (Salvador), TOBAR (R. Gajardo) & JÖRG (M. E.). Investigaciones sobre Triatomidae. Mepraia novum genus de Triatomidae *Mepraia spinolai* (Porter) 1933, nov. comb., redescripción de ♂ y descripción de ♀. [**Mepraia, a New Genus of Triatomidae. Redescription of *M. spinolai*, Male and Female.**]—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina (Jujuy). Publicación No. 44.* 1940. 30 pp. With 27 figs.

MAZZA (Salvador), GIORDANO (Jose J.) & DOBLADEZ (Miguel J. L.). Investigaciones sobre la enfermedad de Chagas. B. II. Forma aguda de enfermedad de Chagas por contaminación de picadura cutánea. [**An Acute Case of Chagas's Disease; Infection by Bite.**]—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina (Jujuy). Publicación No. 43.* 1940. pp. 36–40. With 3 figs.

A child of 2½ years, in San Juan, living in a poor hut highly infested with *Triatoma infestans* was bitten between the left eyebrow and the temple. Within 24 hours there was swelling and oedema followed by enlargement of the pre-auricular, mastoid and cervical glands—the enlargement was present when the patient came under observation three weeks after the initial bite. Tachycardia was still marked 7 months after and a xenodiagnostic test was carried out with larvae of *T. infestans* and the result was positive. *H. H. S.*

MAZZA (Salvador), BASSO (Germinal) & BASSO (Redento). Investigaciones sobre la enfermedad de Chagas. B. V. Forma aguda severa oftalmoganglionar de enfermedad de Chagas, observada en Media Agua (San Juan). [**Severe Acute Case of Chagas's Disease with Adenitis.**]—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina (Jujuy). Publicación No. 43.* 1940. pp. 48–52. With 2 figs.

The patient was a young woman of 16 years, of San Juan, living in a Triatoma-infested dwelling. Her illness began with burning sensation and some pain at the outer angle of the left eye and over the face on that side, with chills, fever and headache. There was considerable oedema; the upper eyelid was white and swollen, the lower violaceous and congested; there was intense injection of the conjunctiva, a pre-auricular gland enlarged to the size of a chickpea, hard and painful. When the blood was examined (thick drop) on the 18th day *T. cruzi* was seen. There was sinus arhythmia and some interference with intraventricular conduction. The oedema persisted for over 3 months before disappearing; the cardiac changes remained. *H. H. S.*

MAZZA (Salvador) & MIYARA (Salomon). Investigaciones sobre la enfermedad de Chagas. B. VIII. Dos adultos con formas severas de enfermedad de Chagas, uno con exantema (*esquizotripanide*) de la Prov. de San Juan. [**Two Severe Cases of Chagas's Disease, One with a Rash.**]—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina (Jujuy). Publicación No. 43.* 1940. pp. 59–72. With 8 figs. & 2 charts.

The reason for mentioning this article is that one of the patients, a Spaniard 34 years of age, on the fifteenth day of his illness developed a rash. On the chest and abdomen were sharply defined red spots from the size of a pin's head to that of a 5-centavo coin, mostly discrete, but in places running together to form a patch as large as the palm. Spots were visible also on the legs and a few on the shoulders. Three days later the individual spots varied in size to that of a rice grain. They were not infiltrated and disappeared momentarily on pressure. There was no pain nor itching. On the 20th day of disease and the 7th of the rash the spots became paler, and had faded altogether in another 7–10 days, *i.e.* the eruption was present for 14–17 days; there was no desquamation. Scrapings from a spot did not reveal any trypanosomes. [This is, so far as the abstracter is aware, the first record of an exanthem in Chagas's disease.] *H. H. S.*

CARINI (A.). Considerações sôbre a moléstia de Chagas. Palestra realisada no Instituto Biologico em 8 de Março de 1940. [**Chagas's Disease: Points raised at a Conference.**]—*Arquivos de Biol.* S. Paulo. 1940. Apr. Vol. 24. No. 226. pp. 77–84. With 5 figs.

CHOLERA.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

LAL (p. 717) has studied the epidemiology of cholera in Bengal; the trend of mortality in many homogeneous districts is definitely declining. There was little evidence that a critical level of absolute humidity is a determining factor in epidemics.

In further studies LODENKÄMPER (p. 717) has found no support for the original contention that vibrios undergo a developmental cycle.

GENEVRAY (p. 717) has succeeded in dissociating the cholera vibrio into smooth and wrinkled colonies, by the use of free chlorine, the technique of which is described. He (p. 717) has obtained comparable results by the use of phenol in place of chlorine, and indicates (p. 718) in what respects the vibrios of the wrinkled colonies differ from those of the smooth. The wrinkled colonies may be re-converted to the smooth type, and are therefore not mutations, but variants.

LAHIRI *et al.* (p. 718) show that an Inaba strain retained its viability in water for periods varying from 1 hour to 18 days, depending on the source and treatment of the water. Autoclaved and filtered waters gave longer durations than raw waters.

BAARS (p. 718) has continued his investigations on the fermentation of glucose by the cholera and El Tor vibrios. LIEB (p. 719) has investigated the utilization of certain amino-acids by the cholera and El Tor vibrios. AIDA (p. 719) shows that there is good agreement between the haemolytic and milk coagulating activities of young strains of cholera and cholera-like vibrios.

WHITE (p. 719) has found that the gelatinous intercellular substance characteristic of cultures of rugose vibrio variants contains a haptene reacting specifically with whole rugose cultures and with antisera to certain rugose extracts. He (p. 720) describes the antigenic properties of a heat-labile somatic protein obtained from vibrios. Injection of this into animals provokes, in a proportion of cases, the formation of precipitins, and it is thought that the substance has a somatic rather than a flagellar origin.

RAYNAL *et al.* (p. 720) show that the activity of trichloracetic acid extracts of cholera vibrios was directly correlated with their virulence and that the best antigenic results were obtained when strains recently isolated from severe cases of cholera were employed. DAMBOVICEANU and BARBER (p. 721) describe the properties of complete antigen extracted from cholera vibrios.

PACHECO and PÉRES (p. 721) found that mucin diminished the bacteriolytic action of anticholera serum.

MERTENS and BEEUWKES (p. 721) found that centrifuged supernatant fluid from suspensions of El Tor, Celebes and some cholera strains was haemolytic. Acetone-alcohol precipitates from these suspensions and from nutrient broth in which the vibrios had been cultivated were non-haemolytic for cholera, haemolytic for El Tor and variable for the Celebes strain.

MARRAS (p. 722) regards the El Tor vibrio as a contaminating non-pathogenic, non-epidemic organism local to the Hedjaz. He states that it possesses a non-specific O agglutinogenic group identical with the Inaba vibrio. He does not consider it to be identical with the Celebes vibrio. DE VOGEL (p. 723) states that in Celebes during 1938 no vibrios which would agglutinate with cholera serum were found in a large number of examinations, and that no El Tor vibrio has ever been isolated outside the regions attacked in the recent peculiar epidemic of cholera. Since the last case in April 1938 no El Tor vibrio has been isolated in the affected region from cases of illness resembling cholera.

IDE (p. 723) points out that healthy cholera carriers from China have in the past entered Japan; passengers are therefore now not allowed to land until the results of stool examinations are known.

C. W

CALCUTTA: ANNUAL REPORT OF THE ALL-INDIA INSTITUTE OF HYGIENE AND PUBLIC HEALTH, 1938. [**Cholera** pp. 13–21, LAL (R. B.).]

The epidemiology of cholera in Bengal has been studied on the basis of homogeneous cholera districts. An endeavour was made to classify such districts into endemic and non-endemic areas, having varying degrees of epidemicity. The endemic regions lie mostly along the lower reaches of the river Hooghly, and non-endemic regions show a low degree of epidemic visitation. In many of these homogeneous districts also it was found that the trend of cholera mortality was definitely declining. In the matter of forecasting cholera little evidence was forthcoming in support of the theory that a critical level of absolute humidity was a determining factor. *W. F. Harvey.*

LODENKÄMPER (H.). Entwicklungsstudien an Vibrionen. II. Mitteilung. [**Developmental Cycle in Vibrios.**]—*Zent. f. Bakt.* I. Abt. Orig. 1940. May 3. Vol. 145. No. 7. pp. 393–402. With 3 figs. [14 refs.]

Further studies on this subject of a cycle of development in bacteria [this *Bulletin*, 1939, Vol. 36, p. 371], in contrast to those in the first communication, showed no attainment of a stable phase and no transformation to normal vibrio forms. *W. F. H.*

GENEVRAY (J.). Dissociation du vibrion cholérique sous l'action du chlore. [**Dissociation of the Cholera Vibrio by Chlorine.**]—*C. R. Soc. Biol.* 1940. Vol. 133. No. 1. pp. 66–68.

After preliminary experimentation the dose of free chlorine in excess (by titration) adopted was 2·6 mgm. per 10 cc. of ordinary peptone water, *p*H 7·4, sown with 5 drops of cholera suspension (1 loopful of a 16-hour culture in 10 cc. peptone water). The chlorine was allowed to act for 45 minutes when 5 drops from each tube were sown in peptone water and incubated 16 hours at 37°C. Again 5 drops of the culture were added to 10 cc. peptone water containing 2·6 mgm. excess chlorine. The process was repeated and repeated. The result, from the third passage, was the appearance on solid media of small dry opaque wrinkled colonies exactly like those described formerly [this *Bulletin*, 1932, Vol. 29, p. 684] alongside the common translucent smooth cholera colonies. The wrinkled colonies were shown to be those of the true cholera vibrio and they showed no tendency even after 15 passages to increase in number. Thus success has been achieved in dissociating the cholera vibrio to give smooth and wrinkled colonies. *W. F. H.*

GENEVRAY (J.). Dissociation du vibrion cholérique sous l'action de l'acide phénique. [**Dissociation of the Cholera Vibrio by Phenol.**]—*C. R. Soc. Biol.* 1940. Vol. 133. No. 2. pp. 196–197.

The separation of cholera vibrio colonies subjected to the action of phenol into two types—smooth transparent and dry wrinkled—was

effected by the fifth passage. Thus the action of phenol was comparable with that shown to occur with chlorine and with the same technique. *W. F. H.*

GENEVRAY (J.). Etude des vibrions cholériques provenant des colonies lisses et plissées obtenues par l'action du chlore et de l'acide phénique. [**Cholera Vibrios from Smooth and Wrinkled Colonies obtained by the Action of Chlorine and Phenol.**]—*C. R. Soc. Biol.* 1940. Vol. 133. No. 2. pp. 197–200.

The two types of colony, smooth and wrinkled, had the same differential characters, whether the dissociation had been brought about by chlorine or by phenol. Vibrios from smooth colonies had all the characters of the strain from which they had been derived. The vibrios of wrinkled colonies, on the other hand, differed from those of the original in macroscopic characters and in the increase of proteolytic, milk-coagulating, haemolytic, haemagglutinating and chlorine-resisting power. It was possible also to bring the wrinkled colony strain back by repeated passages to the smooth colony type. Thus the wrinkled type is but a variant and not a mutation from the original strain.

W. F. H.

LAHIRI (M. N.), DAS (P. C.) & MALIK (K. S.). **The Viability of** *Vibrio cholerae* **in Natural Waters.**—*Indian Med. Gaz.* 1939. Dec. Vol. 74. No. 12. pp. 742–744.

Much more stringent tests are applied nowadays for the diagnosis of the true cholera vibrio. It was thought desirable, therefore, to test once more the viability of the cholera vibrio in natural waters. A freshly isolated vibrio of Inaba type was used and four types of water were put to trial:—(1) Raw untreated; (2) raw autoclaved; (3) filtered raw; and (4) filtered raw autoclaved. The results vary according to the source of the water tested from as little as 1 hour up to 18 days. Autoclaved and filtered (L3 candle) samples of water gave longer durations of viability than raw waters. *W. F. H.*

BAARS (J. K.). Vergelijkend onderzoek van *V. cholerae* and V. El Tor glucose-dissimilatie. [**Comparison of Glucose-Dissimilation by Cholera and El Tor Vibrio.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1940. Feb. 6. Vol. 80. No. 6. pp. 334–346. With 2 figs. English summary.

The present work carries the investigation of the fermentation products of glucose by cholera and El Tor vibrios further under both aerobic and anaerobic conditions, with Difco peptone as the source of nitrogen [this *Bulletin*, 1939, Vol. 36, p. 372]. Both vibrios split the glucose molecule, aerobically and anaerobically, into two C_3 molecules, part of which is recovered as lactic acid. The remainder is transformed further to formic acid and probably acetaldehyde, which latter may be converted into ethyl alcohol and acetic acid (Canizarro) or oxidized to acetic acid or condensed to succinic acid. Further the acetaldehyde may also serve, under aerobic though not under anaerobic conditions, as a source for the formation by the El Tor vibrio of acetyl-methyl carbinol or 2–3 butylene glycol. The El Tor vibrio, moreover, can oxidize a considerable part of the formic

acid to carbon dioxide, a power which is possessed by the cholera vibrio to a much less degree and not at all under anaerobic conditions. The power of direct formation of succinic acid from peptone is possessed much more strongly both under aerobic and anaerobic conditions by the cholera vibrio than the El Tor vibrio. Aerobically the El Tor vibrio converts considerable amounts of the formic acid into carbon dioxide, while the cholera vibrio converts but little. Under anaerobic conditions only the El Tor vibrio produces any carbon dioxide. As a whole the El Tor vibrio ferments glucose more energetically than the cholera vibrio. *W. F. H.*

LIEB (Franz). Typendifferenzierungsversuche am *Vibrio cholerae* und seinen Verwandten. [**Type Differentiation of Cholera Vibrios and their Allies.**]—*Zent. f. Bakt.* I. Abt. Orig. 1939. Dec. 4. Vol. 145. No. 2. pp. 106–109.

The basis of the type differentiation investigated was the capability of different strains to utilize certain amino-acids. For this purpose three media were used :—(1) Asparagin-phosphate ; (2) Alanin-phosphate-ammonium lactate ; and (3) d-Valin-phosphate. Both among cholera and El Tor strains there were found some which were amino-acid positive and some which were negative. *W. F. H.*

BEEUWKES (H.). Sur les ferments protéolytiques du *Vibrio cholerae* et du *Vibrio El Tor.* [**The Proteolytic Ferments of the Cholera and El Tor Vibrios.**]—*Antonie van Leeuwenhoek.* 1939/1940. Vol. 6. No. 1. pp. 48–55. With 2 figs.

[Previously abstracted in this *Bulletin*, 1939, Vol. 36, p. 899.]

AIDA (Toshiro). Beiträge zu den Kenntnissen der biologischen Eigenschaften von Choleravibrionen und anderen ähnlichen Vibrionen. I. Teil : Ueber die Beziehungen zwischen den hämolytischen und den Kuhmilch koagulierenden Wirkungen der betreffenden Bazillen. [**Correlation between Haemolytic and Milk-Coagulation Action of Cholera and Cholera-like Vibrios.**]—*Taiwan Igakkai Zassi* (*Jl. Med. Assoc. Formosa*). 1939. Dec. Vol. 38. No. 12. [In Japanese pp. 1737–1745. [59 refs.] German summary p. 1746.]

Good agreement between the haemolytic and milk coagulating activities was found to exist in young strains of both cholera and cholera-like vibrios, but this agreement was not maintained in about 10 per cent. of the old strains. Repeated subculture appears to weaken both activities. *W. F. H.*

WHITE (P. Bruce). **The Characteristic Haptene and Antigen of Rugose Races of Cholera and El Tor Vibrios.**—*Jl. Path. & Bact.* 1940. Jan. Vol. 50. No. 1. pp. 160–164. [16 refs.]

In a previous investigation on rugose vibrio variants " the question of the serological activity of the gelatinous intercellular substance characteristic of such cultures was left open." It has been found to be a haptene reacting specifically with whole rugose cultures and with antisera to certain rugose extracts. The author's summary is as follows :—" From S, R and ρ rugose cultures of cholera and El Tor

vibrios there may be isolated . . . a common non-protein carbohydrate-containing haptene absent from or inconspicuous in non-rugose cultures. This substance reacts by precipitation . . . with antisera of whole rugose cultures . . . Corresponding with this precipitation there is a rugose agglutination reaction. The rugose antibodies of O group I vibrios agglutinate rugose races of certain vibrios belonging to other O groups . . . and give intense precipitation with their rugose haptenes . . . There is no relation between rugose—non-rugose variation and S-R-ρ change." *W. F. H.*

WHITE (P. Bruce). **A Heat-Labile Somatic Protein Antigen (H. L. S. P.) of Vibrios.**—*Jl. Path. & Bact.* 1940. Jan. Vol. 50. No. 1. pp. 165–166.

An acid precipitate—" H.L.S.P."—was obtained, by a method described, from young mass cultures of vibrios. This precipitate fraction was redissolved in water by careful neutralization and used for the immunization of rabbits. Only about one-third of the animals reacted to furnish precipitins. Most of the H.L.S.P. antisera were devoid of flagellar agglutinins and, indeed, did not seem to clump vibrio cultures of any type above a titre of 1–100. Extracts of H.L.S.P., on the other hand, from S, R and ρ *V. cholerae* and El Tor vibrios were precipitated heavily by their own antisera. What is even more remarkable " is that the H.L.S.P. cholera antisera reacted equally, or almost equally, with the corresponding extracts of all, or most, accredited vibrios," thus far transcending the range of reaction of vibrio flagella and their antibodies. So far only two vibrios—*V. neocistes* and " Rangoon rough 2 " have failed to yield precipitable extracts. It is suspected, therefore, that " Rangoon rough 2 " is not a variant of *V. cholerae*, or even a vibrio at all. The H.L.S.P. fraction is antigenically inactivated at 100°C. in neutral solution and its precipitins " commonly occur in the antisera of S, R and ρ vibrios which have not been exposed to destructive heat. The failure of H.L.S.P. antisera to cause agglutination of vibrio suspensions suggests that the fraction is either a constituent of the deeper bacterial substance, not included in the reactive surface, or that it is a soluble secretion . . . . The bulk of the fraction itself indicates a somatic rather than a flagellar origin." Although extremely wide precipitin reactions are thus obtained with this fraction, they seem to be confined to the vibrio group of organisms. *W. F. H.*

RAYNAL (J. H.), LIEOU (Y. Ch.) & FEISSOLLE (L.). Valeur des extraits trichloracétiques de vibrions cholériques en fonction de la virulence des souches microbiennes. [**Value of Trichloracetic Extracts of Cholera Vibrios and Virulence.**]—*Rev. d'Immunologie.* Paris. 1940. Mar. Vol. 6. No. 2. pp. 132–135.

The process of extraction [this *Bulletin*, 1939, Vol. 36, p. 896] was by trichloracetic acid and was tried out on a series of strains with the result that : (1) The activity of the extracts was found to be directly correlated with the virulence of the strain used. (2) The strains recently isolated from severe cases of the disease are those best suited to furnish antigens having specific, toxic and antigenic character.

W. F. H.

DAMBOVICEANU (A.) & BARBER (Cella). Les propriétés chimiques de l'antigène complet extrait des vibrions cholériques. [**Chemical Properties of Complete Antigen extracted from Cholera Vibrios.**] —*C. R. Soc. Biol.* 1940. Vol. 133. No. 3. pp. 501–503.

The existence of complete antigen in cholera vibrios has already been noted. Extraction of the antigen was carried out with trichloracetic acid and the extract shows toxic, antigenic and allergic characters. The following observations are placed on record :— (1) The extracts do not give the biuret reaction nor do they reduce Fehling's solution : the Molisch reaction is feebly positive. (2) Cholera vibrios are generally poorer in acid-soluble antigen than other bacteria studied. (3) The extract is rather rich in nitrogen and poor in mineral substance. The authors conclude that the acid-soluble antigen of cholera vibrios is a glucosidic lipoid complex containing amino-nitrogen and phosphorus. *W. F. H.*

PACHECO (Genesio) & PÉRES (J. Noronha). Action de la mucine sur le mécanisme de l'infection. Action sur la bactériolyse. [**Action of Mucin on Infection. Action on Bacteriolysis.**]—*C. R. Soc. Biol.* 1940. Vol. 133. No. 2. pp. 337–338.

In this research an anticholera agglutinating serum of 1 in 20,000 titre was used after inactivation by heat. Fresh guineapig serum was added as complement. It was found that serum containing mucin had its bacteriolytic action diminished, as judged by the number of vibrio colonies which developed on plates sown from the test and control mixtures. *W. F. H.*

MERTENS (W. K.) & BEEUWKES (H.). Haemolyseproeven met Cholera-, El Tor- en Celebesvibrionen. [**Haemolysis Tests with Cholera, El Tor and Celebes Vibrios.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1940. May 14. Vol. 80. No. 20. pp. 1246–1270. [11 refs.] French summary.

Haemolytic power has been and still is the chief distinguishing feature between cholera and El Tor vibrios. To these two groups of vibrios has now been added a third, the vibrio isolated during a cholera-like epidemic in Celebes. The El Tor vibrio is haemolytic and the cholera vibrio non-haemolytic. Considerable doubt has been thrown on the statement that cholera is entirely non-haemolytic. The opening sentence of this article, indeed, is an observation of Mertens that : 26 very thick suspensions of cholera vibrios (5 cc.) from 24-hour agar cultures were capable in 24 cases, after 20 hours' incubation, with the addition of 2 drops of a 50 per cent. suspension of once-washed goat erythrocytes, of causing haemolysis of those erythrocytes. The point raised in this statement is whether absence of haemolytic power in the cholera vibrio is merely a matter of degree and whether, given sufficient concentration of vibrios, a weak haemolytic action can be demonstrated. Other types of haemolysis which have been considered in the case of the cholera vibrio are :—late haemolysis after some days' incubation, possession of thermostable haemolysin, and haemolysis exhibited by freshly isolated cultures before subculture. The present article deals mainly with the haemolysis by concentrated suspensions as a means of differentiating cholera,

El Tor and Celebes vibrios. As usual, when a series of strains in any given group of organisms is tested, some one or two exceptional strains are found, which place a check on any sweeping generalization. It is obvious likewise that if any generalization at all on haemolytic potency of vibrios is to be attained, it can only be by close adherence to uniform methods of testing. The authors' summary of their results is as follows :—(1) The centrifuged supernatant fluid of thick suspensions of all strains of El Tor, most strains of Celebes, and some strains of cholera was haemolytic and the haemolysin was thermolabile. (2) The precipitate obtained from the supernatant fluid with 96 per cent. acetone alcohol showed no haemolytic character in the case of cholera, little in the case of Celebes and definite haemolytic power in the majority of El Tor strains. When haemolytic power was present it was not altered by heating. (3) Nutrient bouillon sown with vibrios, incubated for one or two days and centrifuged, showed the supernatant-fluid acetone-alcohol precipitate to be non-haemolytic for cholera and both strongly haemolytic and thermolabile for all strains of El Tor and Celebes. *W. F. H.*

MARRAS (F. M.). Sul vibrione El Tor. Ricerche sierologiche riguardo al gruppo agglutinogeno specifico " O " ed al gruppo agglutinogeno non specifico " O " del v. El Tor. L'epidemia delle Isole Celebes è dovuta al v. El Tor ? Valore della reazione di Voges-Proskauer nell'identificazione dei vibrioni. [**Specific and Non-Specific Agglutinogens of** *Vibrio El Tor*. **Value of Voges-Proskauer Reaction. The Celebes and El Tor Vibrios.**]—*Ann. d'Igiene.* 1940. Jan. Vol. 50. No. 1. pp. 1–11.

Repeated examinations of pilgrims during the years 1936 to 1939 have shown that El Tor vibrios can be found in normal dejecta and in the dejecta of individuals suffering from ordinary diseases. The type of organism is invariably the same and, according to the author, is a local (Hedjaz), contaminating, non-pathogenic, non-epidemic organism. When it has been isolated on the collective or pooled system, it has often been found difficult to track down subsequently the particular carrier of the organism in the quarantine camp. This is explained as due to its rapid disappearance from the intestine during stay in camp. If such carriers are to be detected, examination should be conducted before the pilgrim starts back on his return journey or goes into quarantine camp. The El Tor vibrio is agglutinated by Cairo serum " O," gives the cholera red reaction, ferments mannose and saccharose but not arabinose in 20 hours, and is strongly haemolytic to sheep erythrocytes.

A comparative research on the behaviour of this very uniform type of vibrio in the presence of standard " O " Inaba and Ogawa sera demonstrated that the El Tor vibrio reacted with "O" Inaba serum which had been " absorbed " by Ogawa antigen, but not with " O " Ogawa serum absorbed with Inaba antigen. This is taken to signify that the El Tor vibrio possesses a non-specific O agglutinogenic group identical with the Inaba vibrio. Whereas El Tor vibrios give positive cholera red and Voges-Proskauer reactions, the Inaba, Ogawa and Kolle vibrios give positive cholera red and negative Voges-Proskauer tests.

The author rejects the possibility that the Celebes vibrio is identical with *V. El Tor* because the latter is non-pathogenic and does not produce epidemics. *W. F. H.*

DE VOGEL (W.). Au sujet de l'épidémie cholérique de Célèbes. [**The Cholera Epidemic of Celebes.**]—*Bull. Office Internat. d'Hyg. Publique.* 1940. May–June. Vol. 32. No. 5–6. pp. 556–559.

The discussion regarding the peculiar epidemic of cholera in the island of Celebes still continues and this communication represents question and answer on certain particular points raised. The last of these questions had reference to the examination of persons in good health before and after the epidemic and to whether El Tor vibrio strains could be isolated in the non-infected zone of Celebes. It is answered as follows :—During 1938, examinations were made of 2,264 samples of faeces from different parts of Celebes for dysentery bacilli in the course of routine work and the opportunity was taken at the same time of examining for vibrios. Not a single vibrio which agglutinated with cholera serum was found. No El Tor vibrio has ever been isolated outside of the regions attacked. Moreover, after the last case of El Tor cholera had occurred in April 1938 at Macassar no more El Tor vibrios were found by bacteriological examination of several cholera-like cases in the regions previously attacked.

W. F. H.

IDE (Masanori). **Anti-Cholera Campaign conducted in Japan in 1939.**—*Jl. Public Health Assoc. Japan.* 1939. Dec. Vol. 15. No. 12. pp. 1–5.

Cholera in China is epidemic every year and cholera in Japan occurs only by importation from China. As Japan is not more than 24 hours sea travel from China this is remarkable and must be considered a triumph for the quarantine service. In 1939 no actual cases were imported, but cholera carriers were ; these individuals were apparently "in good health at the time of quarantine inspection." It was possible, however, "to trace the carriers and isolate them at their destinations." This discovery of carriers led to the imposition of a new quarantine regulation, by which instead of passengers being permitted to land on collection of their stools they were only allowed to disembark after the result of stool examination became known.

W. F. H.

DAS (Bon Behary). **The Treatment of Cholera.**—*Med. Bull.* Bombay. 1940. May 18. Vol. 8. No. 10. pp. 348–362.

AMOEBIASIS.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

BØE (p. 725) reports infection with *Entamoeba histolytica* in a woman in Norway ; she had never left that country and had never complained of gastro-intestinal trouble. Although infection with *E. histolytica* is common in Palestine, CANAAN and BLÖMER (p. 725) show that liver

abscess is very rare, occurring in only 11 of 2,960 cases of infection. Similarly, the cases of actual amoebic dysentery are few, but it is pointed out that all carriers should be treated. SENEKJI (p. 726) reports the finding of *E. histolytica* in the faeces of rats in Bagdad. WINFIELD and CHIN (p. 726) have examined various groups of people in North China and give percentages of infection with *E. histolytica* which vary from 4·3 to 25·3. It is pointed out that single examination reveals only one-third of the infections disclosed by repeated examinations.

SCHOENLEBER (p. 727) gives reasons for concluding that food handlers have been responsible for the transmission of *E. histolytica* in an island off Venezuela, and shows that control of these persons has markedly reduced the incidence of infection.

BONNIN and ARETAS (p. 727) show that although normal human serum encourages the growth of *E. histolytica*, serum from a patient who has just completed a 10 days' course of emetine has an inhibitory effect. Amoebae in culture may acquire arsenic resistance on being exposed in culture to arsenical salts. DESCHIENS (p. 727) has shown that in long continued culture, no loss of pathogenicity occurs in *E. histolytica* provided that the strain is induced to encyst periodically by exposure to a temperature of 4°C.

NAUSS and RAPPAPORT (p. 728) show that the invasiveness of *E. histolytica* may be increased by the irritant action of croton oil, and still further increased by the administration of certain bacteria associated in culture with strains of high invasiveness.

BRUG (p. 728) describes an unusual strain of entamoeba from a patient with dysentery. The typical cyst appears to be trinucleate, with one small and two large nuclei.

HAKANSSON (p. 728) points out that if smears of small pieces of faeces are made with tap water, *Blastocystis hominis* and the vegetative forms of *E. histolytica* are destroyed by osmotic action, but the cysts of the latter remain intact for many hours. This procedure facilitates diagnosis, which should be made on the detection of the cysts. In the emulsification of faeces JANER (p. 729) uses 2 per cent. copper sulphate for the unencysted forms of amoebae, and 10 per cent. formalin for the encysted forms.

MAGATH *et al.* (p. 729) found strongly positive complement fixation tests in the sera of 32 per cent. of patients known to be harbouring *E. histolytica*, but as two laboratories failed to agree in 16·7 per cent., it is evident that considerable improvement in the preparation of the antigen will be necessary before the test can be generally adopted for diagnosis.

SAPERO (p. 729) shows that of persons passing cysts but giving no history of dysentery many were symptomless, but of those who did complain of symptoms, usually of vague dyspepsia, the commonest pointing to definite disease were symptoms of acute or chronic appendicitis.

HARÁN (p. 730) reports a case of occlusion of the colon, at the hepatic flexure, by a granuloma which disappeared after emetine treatment. MENDELSON (p. 730) reports a case of intestinal obstruction from an amoebic granuloma. RAJAM and RANGIAH (p. 731) report anal ulceration with anal stricture and heavy infection with *E. histolytica* in a patient who recovered after treatment with emetine and E.B.I.

RIZZO (p. 732) reports two cases of bronchial amoebiasis, with fever and haemoptysis. The chest signs were those of bronchitis but vegetative amoebae were present in the sputum. Treatment with emetine was successful. Pulmonary invasion may take place by the lymphatic or blood stream, as well as directly from the liver.

GREIG (p. 732) reports a case of amoebic hepatitis, which cleared up after a course of emetine, in a patient who showed no signs of dysentery. ALPORT and GHALIOUGUI (p. 733) record 5 debilitated patients with liver abscess treated by aspiration and emetine, with success in 4. In one a secondary infection with *Ps. pyocyanea* was cured by means of the sulphonamide drugs.

LATTOUF (p. 733) considers that recovery from amoebiasis is hastened by the exhibition of calcium, vitamins B and C, and liver extract. VIRNICH (p. 734) reports favourably on the treatment of mild acute cases and of chronic cases of amoebic dysentery by a new Bayer preparation (No. 5547) consisting of arsenic and bismuth. Good results were found by JADIN (p. 734) after the use of diiodo-oxyquinoline in cases of amoebiasis. MAYER (p. 734) reports infection in 23·2 per cent. of 1,083 persons examined in India, and describes the treatment with enterovioform in acute or subchronic cases. For healthy cyst passers he advises emetine as well.

In the *Arquivos de Biologia* (p. 735) treatment by "camphor sulphonate of emetine" is recommended.

ARTAGAVEYTIA (p. 735) gives details of the symptoms of emetine poisoning in two patients. One died with paralysis extending to the muscles of deglutition, and at post mortem infiltration of the medulla oblongata was found. The other recovered. The dosage necessary to produce toxic symptoms varies greatly in different patients.

C. W.

BOE (Johs.). Dysenteriamøbens patogenitet. Foreløbig meddelelse. [**The Pathogenicity of** *E. histolytica.*]—*Nordisk Med.* 1940. Feb. 17. Vol. 5. No. 7. pp. 292–294. With 4 figs. German summary.

A translation of the author's summary is as follows :—

"A case of infection with *E. histolytica* is described.

"*E. histolytica* was found in the faeces of a woman aged 56, who had never complained of gastro-intestinal trouble and who had never left the country [Norway]. The amoebae were typical in appearance and were cultivated in the usual media.

"The complement fixation test with *E. histolytica* antigen, according to Craig's technique, was positive.

"The virulence of the amoebae was tested in kittens. Of four kittens fed with faeces containing cysts, one became infected after 6 days passing loose motions with blood and mucus containing numerous vegetative forms of *E. histolytica.*

"In the colon [of the kitten] typical ulcers were found and sections showed large numbers of amoebae which had penetrated deep into the submucosa."

C. W.

CANAAN (T.) & BLÖMER (H. W.). Amöbiasis in Palästina. [**Amoebiasis in Palestine.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1940. Apr. Vol. 44. No. 4. pp. 157–171. [Refs. in footnotes.]

The authors investigated 400 patients attending the Deaconess Hospital, Jerusalem. The ages ranged between 7 months and 75

years; 238 were townsfolk and 162 fellahin, 204 were females and 196 males; 362 were Arabs and 38 Europeans. Among them all 122 had *E. histolytica* (30·5 per cent.), 111 had Ascaris, 48 Trichuris, 18 tapeworm; only 152 had no parasites in their stools. Only 26·7 per cent. of those with parasites had any signs of chronic intestinal disturbance and nearly one-third of the positive had no intestinal symptoms whatever. Of those with *E. histolytica* only 5·2 per cent. gave the test for occult blood. Liver abscess is very rare in Palestine. In just over five years among 9,690 patients treated at the hospital, 2,960 had *E. histolytica* infection, but only 11 cases of liver abscess were seen (0·37 per cent.). In spite of the numbers harbouring the amoeba those with amoebic dysentery are very few. The entamoebae can, therefore, remain in the intestine for a time, it may be long or short, without giving rise to symptoms, but all carriers should be treated as early as possible and until they are free. *H. H. S.*

SENEKJI (H. A.). **Bacteriological and Parasitological Survey of Rats in Iraq.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1940. Apr. 30. Vol. 33. No. 6. pp. 655–657.

During the routine examination of rats for evidence of plague in Bagdad the opportunity was taken of examining the blood for bacterial infections and the faeces for protozoa and helminths. There was an entire absence of salmonella infections of the blood but in the faeces *Entamoeba histolytica* and *E. coli* as well as *E. muris* are reported. It cannot have been an easy matter to differentiate *E. coli* and *E. muris*, which are singularly alike. A table gives the complete results of the examinations. *C. M. Wenyon.*

WINFIELD (Gerald F.) & CHIN (Ta-Hsiung). **Studies on the Control of Fecal-borne Diseases in North China. VII. The Epidemiology of the Parasitic Amoebae.**—*Chinese Med. Jl.* 1939. Sept. Vol. 56. No. 3. pp. 265–286. [21 refs.]

In connexion with the study of faecal-borne diseases in China the authors have carried out a large number of examinations from the point of view of amoebic infections, chiefly by *Entamoeba histolytica*, in West Shantung. Various groups of individuals, both urban and rural, comprising country families, soldiers, school-children, university students and hospital patients, were selected. The percentage of *E. histolytica* infections varied from 25·3 per cent. in the country family group to 4·3 per cent. in the hospital patient group. The high figure for the country family group, the result of a single specimen from each individual, appears to be the highest incidence on record. It is noted that various observers, of whom the reviewer was the first, have shown that the single examination reveals only a third of the infections disclosed by repeated examinations. Various recorded surveys for intestinal protozoa in China are reviewed and it is noted that, contrary to expectation, the incidence of infections in South China, where there is general use of fresh human faecal material for manuring vegetables, is lower than in North China, where artificial manures are largely used. The difference may be due to the universal use of boiled rice in the south in place of the hand-contaminated cold bread stuffs in the north. On the other hand it may be a question of the type of water supply. There is, moreover, a correlation between the incidence of amoebic and ascaris infections. *C. M. W.*

SCHOENLEBER (A. W.). **The Food Handler as a Transmitter of Amebiasis.**—*Amer. Jl. Trop. Med.* 1940. Jan. Vol. 20. No. 1. pp. 99–106. [Summary appears also in *Bulletin of Hygiene.*]

The author criticizes severely the experimental work of SAPERO and JOHNSON [see *Bull. of Hyg.*, 1939, Vol. 14, p. 746] and their conclusion that food handlers are of minor importance in amoebiasis transmission. At Aruba, an island off Venezuela, are about 1,500 Americans living under conditions which preclude the transmission of infection from water, flies, sewage, or soil contamination of food. They arrive direct from America, so their average amoebic infection rate is not more than 10 per cent. When the population was investigated after several days' residence the results showed that 33 per cent. of the native population, including cooks and servants, were infected with *Entamoeba histolytica* and 25·57 per cent. of the American population. Active measures for the control of dissemination of infection by food handlers were put into effect, but no other control measures. The percentage infected was reduced from 25·57 in 1935 to 12·69, 5·70 and 1·92 in 1936, 1937 and 1938 respectively. The author considers that food handlers are an important means of transmission.

W. G. Savage.

BONNIN (H.) & ARETAS (R.). Action sur *Entamoeba dysenteriae* en cultures de diverses substances et du sérum d'homme ayant reçu de l'émétine. [**Action of Various Substances and of the Serum of a Man who had received Emetine on** *Entamoeba histolytica* **in Cultures.**]—*C. R. Soc. Biol.* 1939. Vol. 132. No. 25. pp. 577–579.

By the use of human serum in medium for the growth of *Entamoeba histolytica* a more rapid multiplication is obtained. If serum from a person who has just completed a ten days' course of emetine be employed culture is definitely hindered. The amoebae multiply less rapidly, are less motile and are smaller. Subcultured into medium containing normal human serum the normal is again attained after two passages. Serum from an individual who had completed a ten-day course of emetine a month before was without action on the amoebae. A number of other substances tested were, in the strengths employed, without effect. Arsenicals were active against the amoebae, which were able to acquire a resistance to the arsenical salts, to the extent of withstanding a 1 in 1,000 concentration when a 1 in 5,000 concentration was at first toxic to them. *C. M. W.*

DESCHIENS (R.). Le pouvoir pathogène des amibes dysentériques en culture, ses relations avec l'enkystement. [**Pathogenicity of Dysentery Amoebae in Culture ; its Relation to Encystment.**]—*Bull. Soc. Path. Exot.* 1939. Dec. 13. Vol. 32. No. 10. pp. 923–926.

It is well known that the long continued cultivation on artificial media of a strain of *E. histolytica* results in a marked decrease in pathogenicity. Thus a strain which gave an infection rate of 70 per cent. for kittens, after three years' culture gave a rate of less than 5 per cent. It is shown in this paper that provided the strain is caused to encyst periodically by exposure to a temperature of 4°C. there is no

loss in pathogenicity even after 6 years' culture. Care was taken when the tests for pathogenicity were carried out that when the amoebae from the strain in which encystment had occurred were inoculated to the cats the bacterial flora of the other strain was present and *vice versa*. It seems clear, therefore, that the differences in pathogenicity of the amoebae cannot be due to changes which had occurred in the bacterial flora. *C. M. W.*

NAUSS (Ralph W.) & RAPPAPORT (Irving). **Studies on Amebiasis. I. Pathogenesis of Mucosal Penetration.**—*Amer. Jl. Trop. Med.* 1940. Jan. Vol. 20. No. 1. pp. 107–127. [40 refs.]

The authors have found that the invasiveness of certain strains of *Entamoeba histolytica* for the intestinal mucosa of kittens and cats may be increased by the irritant action of croton oil or that of the bacteria associated with certain culture strains of *E. histolytica* showing high invasiveness. The invasiveness of *E. histolytica*, increased by the irritant action of croton oil, may be still further increased by the administration of certain associated bacteria. In this manner it became possible to obtain amoebic infections in adult cats of any weight, an observation which appears to throw light on the pathogenesis of *E. histolytica* in man. *C. M. W.*

BRUG (S. L.). **A Curious Entamoebic Strain Parasitic in Man.**—*Ann. Trop. Med. & Parasit.* 1939. Dec. 30. Vol. 33. Nos. 3 & 4. pp. 201–210. With 3 figs.

The amoeba described is from a case of dysentery which had been under observation on a number of occasions during 15 years. At the earliest observation it was noted that the amoebae were difficult to classify. On this account a careful study of the case was subsequently made. The amoebae themselves, though of the entamoeba type, differed from typical *E. coli* and *E. histolytica*. This difference was more marked in the cysts, which were mostly mononucleate, less frequently binucleate and rarely trinucleate. More rarely still cysts with four and six nuclei were observed. Glycogen was not a common content of the cysts. It is considered that the trinucleate cyst with two large and one small nucleus is characteristic of the amoeba. The author thinks that he is dealing with a new species of entamoeba which may have some animal as its natural host. The characters of the amoeba are shown in a series of illustrations. *C. M. W.*

HAKANSSON (E. G.). **A Method of destroying the Blastocysts (*Blastocystis hominis*) in Fecal Wet Smears in order to facilitate the Examination for *Endamoeba histolytica*.**—*Jl. Lab. & Clin. Med.* 1940. Feb. Vol. 25. No. 5. pp. 546–547.

The author states that the differentiation between *Blastocystis hominis* and the vegetative forms (and even the cysts) of *Entamoeba histolytica* is difficult even with fairly high powers of the microscope, and diagnosis of amoebic dysentery should be made on the detection of cysts of the latter. He has found that if thin smears of small particles of faeces are made with tap water in place of physiological saline *B. hominis* and vegetative forms of *E. histolytica* are destroyed or distended by osmotic action, leaving cysts of the latter intact for many hours. These shining refractile cysts can easily be distinguished

from the lustreless distended Blastocystis. If large particles of faeces are used, salts in the faeces may dissolve and produce a practically isotonic solution, thus defeating the object. Small pieces only, therefore, should be taken. *C. W.*

JANER (J. L.). **The Identification of Amebae in Fecal Smears by Copper Sulphate and Formalin.**—*Puerto Rico Jl. Public Health & Trop. Med.* 1939. Dec. Vol. 15. No. 2. p. 191. [Spanish version pp. 192–193.]

The author has found that for the examination of faeces for intestinal amoebae a 2 per cent. solution of copper sulphate for unencysted forms and a 10 per cent. solution of formalin for the encysted stages may suitably be employed in place of the fluids generally used for emulsifying the material. *C. M. W.*

MAGATH (Thomas B.) & MELENEY (Henry E.). With the Technical Assistance of Margaret HUPE & Frances JONES. **The Complement Fixation Reaction for Amebiasis: Comparative Tests performed by Two Laboratories.**—*Amer. Jl. Trop. Med.* 1940. Mar. Vol. 20. No. 2. pp. 211–238. [33 refs.]

The paper describes the results of the complement fixation test carried out with the sera of ninety patients known to be harbouring *Entamoeba histolytica*. Various amoebic antigens were used and to control the results the tests were carried out in two separate laboratories. Considering only the tests which gave a strong fixation the positives were 32 per cent. The two laboratories failed to agree in 16·7 per cent. of the tests. It is evident that a considerable improvement in the preparation of the antigen will be necessary before the test can be generally adopted for diagnostic purposes. The paper is a long one and contains an excellent review and discussion of the subject of complement fixation in amoebiasis. *C. M. W.*

SAPARO (James J.). **Clinical Studies in Non-Dysenteric Intestinal Amebiasis.**—*Amer. Jl. Trop. Med.* 1939. Nov. Vol. 19. No. 6. pp. 497–514.

Though the fact is widely known and generally acknowledged, when attention is drawn to it, that intestinal amoebiasis may be the apparent cause of other symptoms than dysentery, the author does good service in his present analysis of patients with these symptoms, in the absence of dysentery, whose condition cleared up when they were given anti-amoebic treatment. He further limited his investigation to persons who gave no history of previous dysenteric attacks. Some were cyst-passers with no symptoms or complaints, others suffered in various ways and no cause other than the entamoeba could be discovered to account for them. Altogether 216 showed intestinal amoebiasis and of these 100 presented symptoms of one kind or another. In addition to vague dyspeptic symptoms, the commonest pointing to a definite disease was appendicular; 18 out of 47 showed symptoms of acute or chronic appendicitis. [Others were mentioned by BANERJEE, this *Bulletin*, 1940, Vol. 37, p. 118.]

Useful comparisons are made such as that among 106 apparently healthy men harbouring *E. histolytica* 46 (43·4 per cent.) had symptoms, whereas among a control group of 108 who had no intestinal protozoa

only 8 (7·4 per cent.) had any symptoms; also among those harbouring protozoa other than *E. histolytica*, with the exception of those with *Dientamoeba fragilis*, the proportion with symptoms was the same as that in the non-parasitized group. Among 44 with *D. fragilis* 12 had symptoms. *H. H. S.*

HARÁN (Antonio María). Oclusión intestinal por tumor cólico amibiano. [**Occlusion of the Bowel by an Amoebic Granuloma.**]—*Arch. Uruguayos de Med., Cirug. y Especialidades.* 1940. Feb. Vol. 16. No. 2. pp. 177–186.

The existence of amoebic granuloma, a "hypertrophic form of intestinal amoebiasis," has been recorded by several observers and in character and the symptoms they produce they suggest malignant neoplasm. Nevertheless, the condition is not so common that the record of this case can be considered redundant. A woman of 78 years suffered from abdominal pain, meteorism, some vomiting and complete constipation for 48 hours. Her doctor had given her purgatives and administered enemas without benefit. When seen by the author her condition was better than would be supposed with such a history, pulse 90, temperature 37°C., vomiting had ceased, but tympanites was marked. She had a fair night, vomiting did not recur and she passed flatus. As well as the distension allowed, a localized swelling could be made out at the hepatic flexure of the colon. Laparotomy was performed and in the transverse colon 10 cm. from the hepatic flexure a tumour the size of a peach was seen in the wall of the colon. No enlarged mesenteric glands were discovered. The wound was closed and a caecal fistula made, the diagnosis being a malignant growth. Her general fair condition and the absence of anaemia gave reason to doubt this and the idea of an amoebic granuloma came up, though no entamoebae were seen in the faecal matter. She was therefore given 12 injections of 4 per cent. emetine solution, one daily, 48 cgm. At the end of this time radiological examination and colonic enemata showed that the tumour no longer existed. The faecal fistula was closed. Unfortunately, the next day she had a rise of temperature, pneumonia developed and death occurred eight days later. [Nothing is said of any autopsy.] *H. H. S.*

MENDELSON (R. W.). **Surgical Manifestations of Amebiasis.**—*Southwestern Med.* 1939. Nov. Vol. 23. No. 11. pp. 361–366. With 14 figs.

The surgical manifestations of amoebiasis mentioned, with illustrative cases, in this paper are, apart from hepatic abscess, intestinal obstruction from either stricture due to lesions within the bowel, to the presence of an amoebic granuloma, or by pressure from without the result of peritonitis, intestinal perforation either intraperitoneal causing peritonitis, or extraperitoneal, resulting in faecal fistula; lastly, pulmonary abscess usually secondary to abscess of liver.

Obstruction from tumour formation is rare, but an instructive case is detailed. The subject was a young Siamese male who was a pathological pluralist. His blood was positive for subtertian malaria, he was passing hookworm ova, he was a leper, but the direct cause of his coming to hospital was intestinal obstruction. Operation revealed a tumour mass of gelatinous granulation tissue containing many

Amoebic granuloma, high power, shows vegetative amoebae in gelatinous-like tumor substance.

Amoebic granuloma of caecum.
[Reproduced from *Southwestern Medicine*.]

amoebae [see illustrations]. The size of the tumour is not mentioned; Dr. Manson-Bahr states that they may measure 10×12 cm. [see Manson's Tropical Diseases, 16th Edition, 1940, p. 586]. *H. H. S.*

Rajam (R. V.) & Ranganathan (P. N.). **An Unusual Case of Cutaneous Amoebic Ulceration around the Anus.**—*Indian Med. Gaz.* 1939, Dec. Vol. 74, No. 12, pp. 746–748. With 4 figs.

A man of 40 years came to the General Hospital, Madras, complaining of anal ulceration and the passage of blood and mucus for the previous six months. He had had venereal disease and the condition was thought to be an instance of ano-rectal syndrome due to lymphogranuloma inguinale. There was a structure of the anal orifice.

Frei's reaction was, however, negative, and a portion of the ulcerous tissue showed, microscopically, necrosis and numerous amoebae and a rectal smear also revealed *E. histolytica* in large numbers. Treatment by emetine hydrochloride followed by a course of E.B.I. brought about rapid healing of the local lesion and cessation of the discharge of blood and mucus [see this *Bulletin*, 1939, Vol. 36, p. 295; 1940 Vol. 37, p. 121]. *H. H. S.*

MOLINARI (G.). L'amebiasi cutanea. [**Cutaneous Amoebiasis.**]—*Riforma Med.* 1940. Apr. 13. Vol. 56. No. 15. pp. 485–486. With 2 figs.

RIZZO (Juan). Sobre dos casos de bronco-amebiasis. [**Two Cases of Bronchial Amoebiasis.**]—*Prensa Méd. Argentina.* 1939. Nov. 1. Vol. 26. No. 44. pp. 2139–2143. With 3 figs.

According to the author extra-intestinal amoebiasis is important in the Argentine, and pulmonary invasion may occur by way of the lymphatic or blood stream, as well as directly from the liver. There are no symptoms of pulmonary amoebiasis which can be regarded as characteristic and the condition is believed to be an ordinary bronchitis or tuberculous until examination reveals the amoeba. Of the two cases here recorded the first was an Italian, 28 years of age, living in Junín, Buenos Aires Province. Ten months previously to being seen he suffered with muco-sanguineous diarrhoea which cleared up on treatment with Yatren. Some three months later he began to feel ill with cough and diarrhoea, and diffuse pain in the right side of the chest, followed later by expectoration of mucoid and bloody sputum, 50–100 cc. daily. Radiograms showed nothing of importance. In the stools were cystic and vegetative forms of *E. histolytica* and the latter in the sputum also. The condition cleared up after two courses of emetine each totalling 0·56 gm., with an interval of 20 days between, during which Yatren was given.

The second patient was an Argentine, aged 49 years, with a very similar history, but for a week before coming to hospital he had fever to 41°C. with shivering. In the lungs were signs of diffuse bronchitis and there was expectoration to 150 cc. daily of viscid mucus, tinged with streaks of blood. Cystic amoebae were present in the stools, and, in the sputum, vegetative and precystic forms which disappeared with emetine treatment. *H. H. S.*

GREIG (E. D. W.). **Observations on a Case of Amoebic Hepatitis.**—*Jl. Trop. Med. & Hyg.* 1940. June 15. Vol. 43. No. 12. pp. 161–164. With 2 charts & 2 figs.

An interesting case of a man of 25 years who, though he gave no history of having suffered from dysentery, began to have shivering attacks with fever and sweating a fortnight after arrival home from India. No signs of dysentery were found—no amoebae or cysts, no Charcot-Leyden crystals. The rise in blood sugar curve after laevulose was not marked, so the liver function was not greatly impaired, though there were signs of some enlargement and a certain degree of icterus. Blood examination on admission showed leucocytes 24,000 per cmm.; six days later r.b.c. 3,730,000 and a fall in the colour index; polymorphonuclears were 84 per cent. Blood culture sterile; Widal negative to enteric and *Br. abortus*. He was given emetine hydrochloride, grain 1 daily, for ten days. The symptoms soon cleared;

temperature fell to and remained normal; sweating ceased; a month after admission his blood examination showed r.b.c. 4,980,000 per cmm.; haemoglobin 90 per cent.; leucocytes normal. Professor Greig thinks that there was undoubtedly not merely a hepatitis but a small amoebic abscess which in a short time would probably have needed aspiration or surgical measures. Seeing that the disease had lasted for 6 months from the first attacks of shivering to the time of his coming under observation and treatment the patient ought to consider himself remarkably fortunate to have got off so lightly. *H. H. S.*

GREIG (E. D. W.). **Case of Amoebic Abscess of the Liver without Antecedent Dysentery.**—*Jl. Trop. Med. & Hyg.* 1940. May 1. Vol. 43. No. 9. pp. 119–122. With 2 figs. & 2 charts.

GREIG (E. D. W.). **Amoebic Abscess of the Liver which discharged through the Lung.**—*Jl. Trop. Med. & Hyg.* 1940. Aug. 1. Vol. 43. No. 15. pp. 207–210. With 2 charts.

HUARD (P.). Nouvelles recherches anatomocliniques sur les abcès du foie tonkinois. **Recent Anatomical and Clinical Research in Liver Abscess in Tonking.**—*Ann. de l'Ecole Supérieure de Méd. et de Pharm. Indochine.* 1938. Vol. 2. pp. 75–95. With 11 plates.

ALPORT (A. Cecil) & GHALIOUGUI (P.). **Conservative Treatment of Liver Abscesses.**—*Lancet.* 1939. Nov. 18. pp. 1062–1065. With 5 figs.

This paper reports on five cases of liver abscess in very debilitated patients with four recoveries under the established treatment by repeated aspiration and emetine injections. In the first case 120 ounces of pus were removed at the first aspiration, and a total of 270 ounces in four aspirations, with recovery. The second case is noteworthy on account of a secondary *Ps. pyocyanea* infection having been found at the second aspiration; this bacterial infection was treated successfully by three courses of prontosil and one of M. & B. 693, together with the injection of 5 cc. soluseptasine into the abscess cavity, and an operation of a dangerous nature in a debilitated patient was avoided. The authors therefore suggest that this line of treatment is worthy of trial in selected cases of secondary infections of amoebic liver abscesses in place of the open operation. The third case was complicated by broncho-pneumonia on the right side, with pleural effusion necessitating aspiration after the administration of M. & B. 693 had failed to clear up the condition. The fourth patient recovered from amoebic liver abscess under the aspiration and emetine treatment, but was readmitted five months later with amoebic dysentery. The last case proved fatal, and seven abscesses were found in the liver and multiple ones in the lung, so the case was hopeless. Thus this series of cases is an instructive one. *L. Rogers.*

LAFFOUF (Albert G.). **Intestinal Amoebiasis. Its Clinical Aspects and Treatment.**—*Jl. Egyptian Med. Assoc.* 1939. Sept. Vol. 22. No. 9. pp. 543–552.

A "congress" paper based on 230 cases of amoebiasis in which the entamoeba was found to be present. The symptoms are analysed

and the treatment, on the usual lines, detailed. Recovery was thought to be hastened by exhibition of calcium, vitamins B and C and liver extract ; the basis of treatment was a diet leaving but little residue and the correction of constipation. *H. H. S.*

VIRNICH (A.). **Arsenic Treatment of Amoebic Dysentery.**—*Far Eastern Assoc. Trop. Med. C.-R. Dixième Congrès, Hanoi, 26 Nov.–2 Dec., 1938.* Vol. 2. pp. 87–98. [15 refs.]

The arsenical preparation with which this article is mainly concerned is an organic compound of Bayer, consisting of 16·6 per cent. arsenic and 32 per cent. bismuth, a light brown powder, insoluble in water, known as No. 5547 and given by mouth in tablets of 0·25 gm. Five of these were well tolerated. The author employed it for 58 patients, European and Chinese ; 12 were early cases with acute dysentery, 46 were chronic, 40 of whom were cyst-passers and 6 suffered from colitis, following earlier attacks of amoebic dysentery. In two cases quoted three tablets were taken in the day, and by the fourth day in one, the fifth in the other, vegetative entamoebae could no longer be found in the stool. Another had suffered for 10 years on and off and had had all the usual forms of treatment. The stools were negative for entamoeba after 7 days, but they reappeared a fortnight later and a second course was given ; this resulted apparently in cure. The drug is not successful alone in *severe* acute amoebic dysentery, but in light or moderate and in the more chronic cases it is very efficacious. The author notes that the disease is more difficult to cure in China than at home and he thinks this is because of the liability to reinfection in the former. The benefit recorded by the author warrants this drug being given more extensive trial. *H. H. S.*

JADIN (J.). Sur un essai de traitement de l'amibiase par la diiodo-oxyquinoléine. [**Treatment of Amoebiasis with Diiodo-oxyquinoline.**]—*Ann. Soc. Belge de Méd. Trop.* 1940. Mar. 31. Vol. 20. No. 1. pp. 75–76.

Twenty-two natives and three Europeans at the Coquilhatville hospital were treated with 3–4 tablets daily, each of 25 cgm. The immediate, or early, results were promising but whether the benefit is lasting is less certain. In 18 cases amoebae were not found on the third day of treatment. In one patient they disappeared after one day but eleven days later there were amoebae in numbers in what the author euphemistically calls the "crachat rectal." Another after early improvement had a serious relapse a fortnight after cessation of treatment. On the other hand many when re-examined a month or two after were found free of, at all events showed no signs of passing, either cystic or vegetative forms. *H. H. S.*

MAYER (Max). **Observations on Amoebiasis and its Treatment.**—*Indian Med. Gaz.* 1940. May. Vol. 75. No. 5. pp. 262–266.

Routine examinations of stools were carried out on every patient admitted to the hospital where the author was working, and during 12 consecutive months 1,083 examinations were made and in 23·2 per cent. there was found either the vegetative or the cystic form of *E. histolytica*. The symptoms are analysed and the patients divided

into three groups: (1) With gastro-intestinal symptoms related to the infection, *i.e.* with acute or subacute amoebic dysentery; (2) With gastro-intestinal symptoms but with the cystic form only of *E. histolytica* in the stools—subchronic or chronic cases; (3) Passing the cysts but with no appreciable symptoms. The drug used was enterovioform (Ciba), given in doses of two tablets (0·25 gm.) thrice daily after meals. In 15 cases of acute dysentery, the clinical symptoms disappeared in three days or so and no amoebae were seen after 5 days; equally good results are reported in 11 out of 13 with subchronic infections and in 16 out of 18 in the third group. For the last the author recommends six days' combined treatment with emetine and enterovioform. The patients were kept under observation for 6 weeks and in some cases even longer after treatment ceased, to watch for reappearance of the parasite. *H. H. S.*

ARQUÍVOS DE BIOLOGÍA. S. Paulo. 1940. May. Vol. 24. No. 227. pp. 101–102.—As associações de emetina e canfora no tratamento das afeções amebianas. [**Combined Emetine and Camphor in the Treatment of Amoebiasis.**]

The drug referred to is "camphor sulphonate of emetine" used first, states the author, by IMAZ and PASTOR who found it an excellent substitute for emetine hydrochloride without any of the inconveniences of the latter. [There is no bibliography or list of references and we cannot trace any report by Imaz and Pastor on the use of this drug.] It is a white coloured salt, stable and readily soluble in water. It has an amoebicidal and antitoxic action, in dysentery and in hepatitis, it is "one-third less toxic" than [? has one-third the toxicity of (E' um terço menos toxica que)] emetine hydrochloride. The camphor neutralizes the depressant action of emetine on the circulation. It is used in a 2 per cent. aqueous solution, and the dose is 2 cc., which corresponds to 3 cgm. of emetine hydrochloride. In severe cases one ampoule is given, intramuscularly, morning and evening, for 6–12 days, after which treatment is suspended for a month, and the disease has usually cleared up before this. *H. H. S.*

ARTAGAVEYTIA (Alejandro C.). La intoxicación emetínica en clínica. Estudio sobre dos observaciones. [**Two Cases of Emetine Poisoning.**]—*Arch. Uruguayos de Med., Cirug. y Especialidades.* 1939. Oct. Vol. 15. No. 4. pp. 372–388. With 4 figs. [26 refs.]

The first patient was a woman of 40 years passing blood-stained stools and complaining of colicky pain. She had been having injections of Campolon and emetine hypodermically, without any effect on the stools and, the author calculates, she had received in all 1·64 gm. in a month. The main toxic effects were on the nervous system, inability to hold up the head and affection of the leg muscles so that walking was difficult; deep reflexes of the legs were diminished, but there was "no paraesthesia or ataxia"; Babinski response normal, and sensation of heat, touch, and pain not affected. She was given Betaxin and injections of strychnine but without effect. Four days after coming to hospital she had difficulty in swallowing, fluid returned through the nose and the voice became nasal. Pulse rate increased, dyspnoea came on and death occurred ten days after admission. A limited post mortem was carried out and changes of congestion and mononuclear celled infiltration were seen in the bulb.

The second patient was a woman of 55 years who, a month before coming to hospital, had had dysenteric symptoms and amoebae were found in the stools. She was given emetine with good results. In 18 days she received 1·44 gm. She also presented widespread muscular weakness affecting arms and legs, left more than right; she could not lift her hands up to her head; tendon reflexes were weak but still present. There was no affection of deglutition. Treatment adopted was the same as in the former case, but with happier result. Improvement was prompt and maintained, and the patient left hospital, apparently quite well, 25 days after entering hospital.

The author gives a list of 20 patients who presented toxic symptoms after emetine, together with the total amount of the drug they had received. This was very variable; one showed fibrillation after 0·12 gm. in six days; another recovered after 1·64 gm. *H. H. S.*

MALARIA.

Précis of Abstracts in this Section.

Boyé (p. 737) describes a rapid method of staining blood slides for malaria parasites by means of Stévenel's blue and eosin. The preparation of Stévenel's blue is described; it can easily be made from methylene blue and potassium permanganate. The method was found to be very successful under conditions of active service.

Weyer (p. 738) discusses the benign tertian malaria which occurs in East Friesland and points out that there is less close contact between man and *A. maculipennis* var. *atroparvus* in Emden than in Holland. He considers that the cheapest means of control is the detection and treatment of infected persons.

de Meillon and Gear (p. 739) report the case of a patient whose first, acute, attack of malaria was due to *Plasmodium ovale*. This is evidence that *P. ovale* is not merely an abnormal form of *P. vivax* appearing in chronic infections, as has been held. Webb and Hervel (p. 739) report infection with *P. ovale* in Mauritius.

Field and Le Fleming (p. 739) have studied the morphology of *P. falciparum* in blood films.

Boyd (p. 739) has found that there are well fixed strains of *P. vivax* and *P. falciparum* showing immunological differences which may be preserved through many sexual cycles in the mosquito. The strains and the mosquitoes with which they are associated in nature may or may not be specially suited to each other.

Covell and Harbhagwan (p. 740) show that in the malarious district of Wynaad, S. India, *P. falciparum* is the commonest parasite when the parasite rate is highest, but that at other times *P. vivax* is more prevalent. A list of anophelines found is given; *A. fluviatilis* is the only important vector; it appears to be anthropophilic and the infection rate is high. Its breeding habits are referred to and methods of control, including house spraying with insecticides, are advised. Past attempts to drain swamps have only provided increased facilities for the breeding of this dangerous vector. White and Adhikari (p. 741) have found *A. sundaicus* round the Chilka Lake on the coast of

the Bay of Bengal, and this accounts for much that was obscure in the epidemiology of malaria, which is intense in this region. They do not agree with the suggestion that the outlet of the lake to the sea should be closed in the dry season to drown out the shallow foreshore breeding places, and give reasons for their views.

RUSSELL and MOHAN (p. 741) suggest that in attempts to infect anophelines experimentally, controls of *A. stephensi* bred in an insectary from tap water larval environment should be used. This species is easy to work with and is widespread in India.

GELLER (p. 742) and BALCACHINA (p. 742) both provide lists of the anophelines found in Kasakhstan in east-central Asia.

BANG *et al.* (p. 742), in Tennessee and Kentucky, have found natural infection of *A. walkeri*, a species which had previously been suspected on experimental grounds to be a vector.

VARGAS (p. 743) remarks on the possibility of epidemic spread of malaria in the São Paulo plateau, where known vectors are to be found and where indigenous malaria does occur.

MILLET (p. 744) discusses suprarenal deficiency in relation to malaria, and considers that lack of certain dietetic substances such as ascorbic acid, cysteine, chlorine and cholesterin predispose to chronic deficiency which may be latent but which may be fully manifested in response to an infective attack. In treatment, therefore, adequate nutrition should be provided. KRISHNAN (p. 744) discusses the vitamin C excretion and saturation of patients, showing that in chronic malaria there is a state of subscurvy. He refers to the treatment of blackwater fever by cortin, ascorbic acid and glucose.

DIKSHIT (p. 745) shows that neither plasmoquine nor atebrin, in the usual therapeutic doses, influence the activity of non-pregnant uterine muscle or are likely to pass through the placenta. SIEGENBEEK VAN HEUKELOM (p. 745) found that after treatment of subtertian malaria with atebrin or quinine the haemoglobin values tended to rise in patients whose haemoglobin values had previously been below 60, and tended to fall in those whose values had been over 60.

CHRISTOPHERS and FULTON (p. 745) have investigated the dissociation constants of plasmoquine.

RASKINE (p. 746) states that treatment of benign and subtertian malaria by a combination of acriquine with quinoline is successful; schizonts disappear in just over 4 days, and gametocytes of *P. falciparum* in 6 days. CHOPRA *et al.* (p. 746) report unfavourably on M3 in treatment. YAMAMOTO (p. 746) reports unfavourably on sulphanilamide in treatment.

COVELL and AFRIDI (p. 747) discuss antimalarial operations in Delhi laying stress on the spraying of dwellings with pyrethrum insecticides. The cost of these measures is given. *C. W.*

BOYÉ (R.). Méthode de coloration extra-rapide des hématozoaires du paludisme par le "Romanowsky" simplifié au bleu de stévenel-éosine, en deux temps. [**Rapid Staining of Malaria Parasites with Stévenel's Blue and Eosin in Two Stages.**]—*Bull. Soc. Path. Exot.* 1940. Apr. 10. Vol. 33. No. 4. pp. 248–252.

Mobilization of the forces in N. Africa was followed by a sudden and intense exacerbation of malaria, and under the existing conditions laboratory facilities on the peace-time scale were not available. The author found difficulty with an old supply of Leishman's stain, and,

in searching for an easy alternative method, devised the following :— On a partly spread thick drop of blood, dehaemoglobinized and fixed in the usual way, eosin solution 1 in 1000 is flooded for 15 to 20 seconds. The slide is rinsed in a fine stream of water until no red colour is seen to come from it and it is then covered with Stévenel's blue undiluted for 40 to 45 seconds. It is then rinsed and appears to be uniformly stained a bluish purple. Examination may be made at this stage or a second staining with the eosin may be performed for a few seconds to obtain the optimum violet lilac colour. The method is rapid and certain and can be used under field conditions, it dispenses with the accurate measurements and neutralization of distilled water required by the Romanowsky methods, and is the best of the rapid methods for the diagnosis of malaria. Stévenel's blue can easily be prepared from medicinal methylene blue and potassium permanganate. [The preparation of this stain is given by Stévenel as follows (*Bull. Soc. Path. Exot.*, 1918, Vol. 11, p. 870) : 1 gm. methylene blue is dissolved in 75 cc. water ; 1·5 gm. potassium permanganate is dissolved separately in 75 cc. water ; when solution is complete the two are mixed in a flask, and an enormous precipitate at once forms with almost complete decolorization of the liquid. The flask is placed in a water bath for at least ½ hour, during which time the precipitate redissolves and the liquid becomes a deep violet blue colour. After filtration the stain is ready for use.] *C. W.*

TRANSACTIONS OF THE IIIRD TRANS-CAUCASIAN CONGRESS FOR THE CAMPAIGN AGAINST MALARIA AND OTHER TROPICAL DISEASES, BAKU, 20–26 JAN., 1936.—558 pp. 1939. Tiflis. [16 roubles, 50 kopecks.]

This volume contains 78 papers, largely of local interest. *C. W.*

WEYER (Fr.). Malaria und Malariaübertragung in Ostfriesland. (Eine entomologische Studie.) [**Malaria and its Transmission in East Friesland.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1940. Jan. & Feb. Vol. 44. Nos. 1 & 2. pp. 1–29 ; 59–73. With 2 figs. [20 refs.]

The author gives a full account of the malaria of East Friesland, the only area in Germany in which the disease is still native. The paper contains matter of considerable general interest.

The epidemic characteristics of the disease are those which have been observed elsewhere in northern Europe. Benign tertian is the only type found. The cases occur within the town of Emden, and the annual number of fresh cases has ranged from 50 to 327 in the last seven years. Careful studies of the malaria in this small area have been carried out since 1910. On the entomological side, it is found that *A. maculipennis* var. *atroparvus* is much more prevalent than *messeae*, the only other variety which occurs. There is a full account of the seasonal resting places, feeding habits, &c., of the insects ; in general they are not common in houses.

Much of the value of Weyer's work lies in the comparison of his conclusions with those reached by Dutch workers. As there has been an exchange of visits and ideas, it seems that the differences are actual, and not due to ways of recording or observing. One interesting point is that in Holland people sleep in the attics, which are attractive to *atroparvus* ; in Emden they sleep on the ground floor,

and are in less close contact with the mosquito. In East Friesland new infections are most commonly detected in July and August. The author says that in this there is a difference from Holland in which the peak is from mid-September to the end of October; but here we believe him to be in error, for it was many years ago that Dutch malaria was autumnal, and it is now commonest in summer.

The view is put forward that in the area under study, the cheapest means of control is the detection and treatment of the infected human beings. Has full consideration been given to the destruction of adult mosquitoes in houses? *P. A. Buxton.*

DE MEILLON (Botha) & GEAR (James). *Plasmodium ovale* **Infection acquired during a Short Visit to a Malarious Country.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1940. Apr. 30. Vol. 33. No. 6. pp. 597–600. With 1 coloured plate.

The case described is of interest as the patient left a non-malarious area for the first time in her life to make a fortnight's trip in Southern Rhodesia. A week after her return she became ill and was found to have a *Plasmodium ovale* infection. The authors point out that a case such as this one shows that the view that *P. ovale* is merely an abnormal form of *P. vivax* appearing in chronic infections is quite unsound. The parasites from the case are shown in a coloured plate.

C. M. Wenyon.

WEBB (J. Lewis) & HERVEL (J. E.). **A New Record of** *Plasmodium ovale* **(Stephens, 1922).**—*Parasitology.* 1940. Apr. Vol. 32. No. 1. pp. 63–66.

The paper records a *Plasmodium ovale* infection in a Creole woman, an inmate of the Mental Hospital at Beau-Bassin, Mauritius. The infection was followed through all its phases, all stages of development of the parasite being found. A footnote to the paper records a second case from the prison which is close to the mental hospital. *C. M. W.*

FIELD (J. W.) & LE FLEMING (H.). **The Morphology of Malarial Parasites in Thick Blood Films. Part II.** *Plasmodium falciparum.* —*Trans. Roy. Soc. Trop. Med. & Hyg.* 1940. Mar. 20. Vol. 33. No. 5. pp. 507–520. With 4 figs. & 6 plates (4 coloured). [11 refs.]

This paper is the second of the series dealing with the characters of malarial parasites in thin and thick films. In this one *Plasmodium falciparum* is shown in a number of plates, coloured and black and white, the appearance in the thick film being compared with those of the thin film made at the same time. The value of the paper is in the plates themselves, which with the descriptive matter should make it possible to identify the species of parasite from the appearances in the thick film alone. *C. M. W.*

BOYD (Mark F.). **On Strains or Races of the Malaria Parasites.**—*Amer. Jl. Trop. Med.* 1940. Jan. Vol. 20. No. 1. pp. 69–80. [19 refs.]

From observations on a number of strains of *Plasmodium vivax* and *Plasmodium falciparum* which were employed for infecting various

anopheles and human beings it was observed that well fixed subspecific varieties, strains or races are detectable immunologically. The antigenic character of one strain of *P. vivax* was preserved after the completion of 40 sexual cycles in the mosquito. A local strain of parasite may or may not be specially suitable for infecting the anopheles with which it is closely associated in nature, while, conversely, these anopheles may or may not be highly susceptible to exotic strains of parasite. In certain cases the strains or races of one species of parasite may reveal slight morphological differences, but it is not yet clear that such characters are fixed. The observations recorded in this paper and those made by other observers quoted by the author indicate the existence of an extensive and unpredictable number of strains of the species of malarial plasmodium. *C. M. W.*

COVELL (G.) & HARBHAGWAN. **Malaria in the Wynaad, South India.**—*Jl. Malaria Inst. of India.* 1939. Dec. Vol. 2. No. 4. pp. 341–376. With 1 map. [10 refs.]

The Wynaad is a hilly plateau, 3,000 feet above sea level, 60 miles long and 39 miles broad, on the Western Ghats above the plains of Malabar. In the south and west of the plateau there are numerous rounded laterite hills. Among the hills there is a network of swamp. There are numerous hill streams. The Kabbani River drains the waters of the plateau into the Cauvery. There are extensive forests. Tea planting is the most important asset of the Wynaad. The population is below 100 to the square mile.

The Wynaad has long had an unenviable reputation for malaria. The authors made observations on the spleen and parasite rates of children, in several places, periodically, throughout a year. In Sultan's Battery the spleen rate remained constantly between 59 and 69 per cent. ; the parasite rate varied from 17 in November to 56 per cent. in May. When the parasite rate was highest *P. falciparum* was most in evidence : at other times *P. vivax* was the more prevalent. In the winter months *P. malariae* is common.

The following species of Anopheles were found either as adults or larvae or as both :—*aconitus, aitkeni, annularis, barbirostris, culicifacies, hyrcanus* var. *nigerrimus, insulaeflorum, jamesi, jeyporiensis, karwari, leucosphyrus, maculatus, majidi, pallidus, splendidus, subpictus, tessellatus, vagus* and *varuna.* During 14 months 11,930 mosquitoes were dissected : only *A. fluviatilis* was found infected. The infection rate of this species was very high, the average monthly rate for 15 months being 20 per cent. *A. fluviatilis* is the only vector of importance : it is a house-haunting species and requires specialized breeding places. It formed 70 per cent. of the total anophelines caught in human dwellings but only 1 per cent. of the number caught in cattle-sheds. Of 1,681 *A. fluviatilis* whose gut contents gave a positive precipitin reaction 97 per cent. contained human blood. The chief breeding places of *A. fluviatilis* are ricefield drains, small streamlets and larger streams having a moderate current and grassy edges. During monsoon rains larvae were also found in shallow wells. Herbage packing of ricefield drains gave encouraging results. Clean edging and weeding of streams near houses and periodic flushing of small streams are valuable measures. The method of shading is suitable for estates. Spraying houses with pyrethrum insecticides should be effective against this

house-haunting species. The attempts to drain swamps that have been carried out in the past have only provided increased breeding facilities for this one dangerous malaria vector. *Norman White.*

WHITE (R. Senior) & ADHIKARI (A. K.). **On Malaria Transmission around the Chilka Lake.**—*Jl. Malaria Inst. of India.* 1939. Dec. Vol. 2. No. 4. pp. 395–423. With 1 graph, 2 figs. & 4 plates (1 map). [15 refs.]

The Chilka Lake, a large bay in the coast of the Bay of Bengal cut off from the sea by drift of sand, is becoming familiar to students of malaria literature. The intense malaria on its shores has been investigated several times since 1912 but the chief anopheline vector remained a matter of doubt. Earlier investigators had failed to find *A. ludlowi*. The authors commenced a year's study of the problem in 1937. In March of that year they found *A. sundaicus*. It is possible that it was a recent introduction : its presence accounts for much that would otherwise be obscure in the epidemiology of malaria in this region. *A. annularis* and *A. aconitus* probably play a part in maintaining a certain degree of malaria around the lake.

In giving an account of their year's observations the authors do not approve STRICKLAND's recommendations that the outlet of the lake at the seaface should be closed during the dry season, thus raising the water in the feeder rivers and drowning out the shallow foreshore breeding places [see this *Bulletin*, 1939, Vol. 36, p. 137]. They point out that the breeding is in the floating algal belts. Moreover, the valuable fisheries of the Chilka Lake are for marine species ; to freshen the lake might result in the substitution of these by much less valuable fresh-water species. It is premature to suggest remedies ; much more information is required regarding the distribution and bionomics of *A. sundaicus* and of the character of the malaria caused by this and possibly other species, matters which are now being investigated by the Malaria Institute of India. *N. W.*

RUSSELL (Paul F.) & MOHAN (Badri Nath). **On Experimental Malaria Infections in Certain Anopheles of South-Eastern Madras.**—*Jl. Malaria Inst. of India.* 1939. Dec. Vol. 2. No. 4. pp. 425–431. [13 refs.]

This paper contains an account of attempts at experimental infection of *A. annularis*, *A. barbirostris*, *A. culicifacies*, *A. stephensi*, *A. subpictus*, *A. varuna* and *C. bitaeniorhynchus*. The chief interest of the paper lies less in the results of these attempts than in the suggestion that in India insectary-bred *A. stephensi* from tap-water larval environment might be used with advantage as a control to measure the significance of experimental infections of other species. *A. stephensi* is very widespread in India ; it has been found naturally infected in many widely separated places ; it is easy to work with, colonizing well in small cages ; it feeds readily on man, cattle, monkeys and sparrows, and it is highly susceptible to experimental infection with probably all three species of plasmodia. The species under investigation would be fed simultaneously and handled in precisely the same manner as the insectary-bred *A. stephensi* control. Amongst other things, negative results might have a significance that they do not possess at present, if this suggestion were adopted. *N. W.*

i. GELLER (E. R.). Sur la faune des coulicidés du Kasakhstan. [**Mosquito Fauna of Kasakhstan.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1939. Vol. 8. No. 5. [In Russian pp. 39–48. With 9 charts. French summary p. 49.]

ii. BALCACHINA (E. I.). La fauna de culicinae de la région du Kasakhstan Méridional. [**Mosquito Fauna of Southern Kasakhstan.**] —*Ibid.* [In Russian pp. 19–37. With 5 figs. French summary p. 38.]

i. Little has hitherto been published regarding the mosquito fauna of the vast east-central Asiatic territory Kasakhstan. The present article is based on observations carried out by the author during four years and on the material collected by antimalaria stations. The climate is continental and shows all variations from a " forest climate " with a maximum rainfall in June and July, to a climate characteristic of the steppes with a less uniform distribution of rainfall throughout the year, and then to a desert climate with maximum rainfall in winter and spring and a hot and dry summer. Kasakhstan contains the northern limit of distribution of the majority of species of Anopheles that are found in Asia Minor.

The distribution of mosquitoes is dependent on climate. In the southern part the following species of *Anopheles* were found, *maculipennis sacharovi*, *pulcherrimus*, *superpictus*, *algeriensis*, *bifurcatus* and *hyrcanus*. The mountainous part of eastern Kasakhstan harbours *A. maculipennis*, *A. hyrcanus* and *A. bifurcatus*. In the Altai mountains *A. bifurcatus* was not found. *A. maculipennis* was found throughout the territory ; var. *messeae* was most in evidence. A variety of *A. maculipennis atroparvus* was found in the Irtyche valley. The paper includes a list of 30 species of mosquito that were identified during the investigation.

ii. The observations of Balcachina were confined to southern Kasakhstan situated along the frontier of two deserts, one a southern type of desert, the other having the characteristics of the deserts of central Asia. Near the southern desert *A. pulcherrimus* occurs and *A. maculipennis* is comparatively infrequent. Near the northern desert *A. maculipennis* is predominant, while *A. pulcherrimus* is not found. *A. hyrcanus* is abundant in both types of country. In areas near mountains *A. bifurcatus* is found, its prevalence being determined by the abundance of spring water. Thus near the central Asian type of desert the anopheline fauna is limited to two, rarely three, species, *maculipennis*, *bifurcatus* and *hyrcanus*. Near the southern type of desert and along the foot of mountains five species occur, *maculipennis*, *bifurcatus*, *pulcherrimus*, *superpictus* and *hyrcanus*. *N. W.*

BANG (F. B.), QUINBY (G. E.) & SIMPSON (T. W.). *Anopheles walkeri* (**Theobald**) : **a Wild-Caught Specimen harboring Malarial Plasmodia.**—*Public Health Rep.* 1940. Jan. 19, Vol. 55. No. 3. pp. 119–120. With 2 figs. on 1 plate.

A. walkeri is very prevalent in the Reelfoot Lake region of Tennessee and Kentucky where it has a tendency to bite man. In the laboratory it can transmit both *P. vivax* and *P. falciparum*. For these reasons it has been under suspicion as a vector of malaria. It is not easy to collect adult *A. walkeri* in numbers : they remain hidden in swamps. The best method of collection is by means of the New Jersey light trap.

A series of dissections of light-trap caught specimens was undertaken. The 231st specimen dissected had heavily infected salivary glands and 6 oöcysts were found on the stomach. These were indistinguishable from the sporozoites and oöcysts of human malaria. *N. W.*

VARGAS (Abel). Alguns aspetos epidemiológicos da malária no planalto de São Paulo. [**Certain Epidemiological Aspects of Malaria in the São Paulo Plateau.**]—*Ann. Paulist. Med. e Cirurg.* 1939. Dec. Vol. 38. No. 6. pp. 445–453.

This paper contains a general discussion of endemic malaria at high altitudes and describes the conditions in the São Paulo plateau at altitudes over 700 metres above sea level. There are seasons of the year when meteorological factors are not unfavourable to the mosquito cycle of development of the malaria parasite. Malaria vectors such as *A. albitarsis* and *A. tarsimaculatus* are to be found and indigenous cases of malaria do occur. The author believes that the introduction of any considerable number of gamete carriers might well result in an epidemic manifestation of the disease. *N. W.*

DEL VECCHIO (Gaetano). Osservazioni sulle ninfe di *A. claviger* (*bifurcatus*). Nota II. *A. claviger* var. *petragnanii*. [**The Pupa of** *A. claviger* **var.** *petragnanii*.]—*Riv. di Parassit.* Rome. 1939. Dec. Vol. 3. No. 4. pp. 305–316. With 16 figs. (2 coloured) on 3 plates. English summary (4 lines).

"The author following his researches on *A. claviger* (*bifurcatus*) describes the fundamental characters of the pupa of *A. claviger* var. *petragnanii*, and confirms the importance of the natatory membranes, of the spines of certain abdominal segments, and of the breathing trumpets in regard to differential diagnosis."

CORRADETTI (Augusto). La biologia dell'*Anopheles gambiae* e il problema malarico nell'Africa Orientale Italiana. [**Biology of** *A. gambiae* **and the Malaria Problem of Italian East Africa.**]—*Riv. di Biol. Colon.* Rome. 1939. Oct. Vol. 2. No. 5. pp. 321–327. English summary (5 lines).

The author describes the wide distribution of *A. gambiae* in Italian East Africa, the multiplicity of its breeding places, and the great difficulties that would be encountered in attempts at its control. His experience is similar to that of many observers in countries in which this species is an important vector of malaria. *N. W.*

CORRADETTI (Augusto). Descrizione dell' *Anopheles* (*Neocellia*) *dancalicus*. [**Description of** *A. dancalicus*.]—*Riv. di Parassit.* Rome. 1940. Mar. Vol. 4. No. 1. pp. 31–44. With 8 figs. & 1 plate.

VARGAS (Luis). Notas sobre la quetotaxia de la larva del *Anopheles pseudopunctipennis* de Temixco Morelos. [**The Arrangement of the Hairs of** *A. pseudopunctipennis* **of Temixco.**]—*Rev. Inst. de Salubridad y Enfermedades Trop.* Mexico. 1939. Nov. Vol. 1. No. 1. pp. 79–99. With 9 figs. [10 refs.] English summary (7 lines).

VARGAS (Luis). Notas sobre mosquitos nuevos para Mexico. [**New Mosquitoes of Mexico.**]—*Rev. Inst. de Salubridad y Enfermedades Trop.* Mexico. 1939. Nov. Vol. 1. No. 1. pp. 101–104.

WILLIAMS (Cicely D.). **Clinical Malaria in Children.**—*Lancet.* 1940. Mar. 9. pp. 441–443.

This is an adequate account of the clinical manifestations of malaria in young children, and their treatment, based on a large clinical experience. *N. W.*

MILLET (Clodomir Teixeira). Paludismo e suprarenaes. Formas suprarenaes do paludismo. Syndrome de Fraga. [**Malaria and the Suprarenal Glands.**]—*Brasil-Medico.* 1940. Jan. 20. Vol. 54. No. 3. pp. 36–47. English summary.

"With reference to 4 cases treated by him, the author analyses the clinical manifestations and humoral disturbances of paludic suprarenalitis. Amongst the less frequent symptoms of the acute forms, he mentions pigmentation, observed, however, in two of the cases. He studies the pathogeny of the asthenia and circulatory disturbances, amongst which hypotension and orthostatic tachycardia (Fraga's sign) are the most marked.

"In examining the humoral disturbances, he calls attention to the importance of the changes in metabolism of minerals—chlorine, sodium and potassium—of the carbohydrates, creatin, cholesterine, the amino-sulphurated compounds and vitamin C.

"The author considers the state of qualitative sub-alimentation or lack of certain substances, such as Ascorbic acid, cystein, chlorine and cholesterine, as a factor of great importance in predisposition or constitution of chronic suprarenal deficiency, latent, but manifesting itself fully in response to an infective attack.

"In the treatment, therefore, adequate alimentary régime should not be overlooked. The same care of the diet should be exercised as in the prophylactic fight with paludism."

CALCUTTA: ANNUAL REPORT OF THE ALL-INDIA INSTITUTE OF HYGIENE AND PUBLIC HEALTH, 1938.—[**Malaria** pp. 27–31, KRISHNAN (K. V.).]

Reference is made to the value of a combination of cortin, ascorbic acid and glucose in the treatment of blackwater fever. Observations have been carried out in a hyperendemic malarial village in Bengal to determine the vitamin C excretion and saturation in normal and malarial subjects. The majority of healthy children aged from 2 to 10 had normal vitamin C saturation: the majority of malarial patients showed marked deficiency of vitamin C. During an acute attack of malaria the excretion of ascorbic acid is increased; it is markedly diminished during afebrile intervals. In chronic malaria there is a subscurvy state that is exacerbated by attacks of fever. Hypovitaminosis C is most marked among the poorest classes.

In the Burdwan district epidemic malaria appears to be associated with unusual rainfall during the dry months February and March. In non-epidemic years *P. malariae* is most in evidence throughout the year. If *P. falciparum* should gain an ascendancy during the early months of the year an epidemic is likely to follow.

A. philippinensis, the local vector, in the area studied, breeds in only a small proportion of the tanks: a high ratio of CO_2 to O_2 appears to

favour this breeding. The larvae of this species were never found in tanks which contained many Euglena. *A. philippinensis* has not been found breeding in rice-fields. *N. W.*

DIKSHIT (B. B.). **Plasmoquine in Pregnancy, with Special Reference to the Action on the Foetus.**—*Jl. Malaria Inst. of India.* 1939. Dec. Vol. 2. No. 4. pp. 387–393. With 2 plates.

Experiments are described which show that neither plasmoquine nor atebrin, in doses equivalent to human therapeutic doses, influences the activity of non-pregnant uterine muscle. Plasmoquine administered in toxic doses to the mother does not filter through the placenta in sufficient quantity to influence the respiration or heart's action of the foetus. If as much plasmoquine as 10 mgm. per kgm. body weight be given to the mother the presence of the drug in foetal blood and tissues can be detected chemically, but the quantity passing through the placenta is not large. With doses of 2 mgm. per kgm. and still less with a dose of 0·4 mgm. per kgm., equivalent to the human therapeutic dose, there is no probability of the drug passing the placenta. *N. W.*

SIEGENBEEK VAN HEUKELOM (A.). Haemoglobinebepalingen bij lijders aan acute malaria tropica. [**Haemoglobin Changes in Acute Malaria.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1940. Feb. 13. Vol. 80. No. 7. pp. 386–395. With 2 charts. English summary.

" 1. The course of the haemoglobin content of the blood of 56 adult native or Chinese men suffering from uncomplicated malaria tropica was charted for nine consecutive days. In the case of twelve patients treatment consisted of " atebrin pro injectione," 300 mg. on two consecutive days, followed by " atebrin " by mouth during three days, 300 mg. daily. Fourteen patients each received 1·6 grams of quinine hydrochloride per day. In thirty patients 300 mg. of atebrin were injected on each of two consecutive days followed by 1·6 mg. of quinine hydrochloride by mouth per day for three days.

" 2. On the average, considerable rises of the haemoglobin content were observed in the groups where the original values had been below 60 ; but where original values were above 60, there was a notable drop : in other words, a convergence of the haemoglobin curves. In the haemometer used 100 on the scale is equivalent to 16 grams per cent. of haemoglobin.

" 3. Characteristic differences between the atebrin, quinine and atebrin-quinine groups could not be determined.

" 4. Of the thirty-one persons with an initial haemoglobin value of over 60, thirteen had values between 90 and 115, which must be considered very high for the social group to which these persons belonged.

" 5. The suggestion is made that these abnormally high values are the result of a blood concentration, and that the fall in the haemoglobin content noted was partly merely apparent."

CHRISTOPHERS (S. Rickard) & FULTON (J. D.). **The Dissociation Constants of Plasmoquine.**—*Ann. Trop. Med. & Parasit.* 1940. Apr. 30. Vol. 34. No. 1. pp. 1–11. With 2 figs.

" 1. Plasmoquine possesses two demonstrable dissociation constants : one, probably connected with the diethylamino group of the side-chain, having a value as determined by us of 3·93 ; the other, much weaker and of uncertain origin, determined by us as 10·51.

"2. These determinations have been made by titration of suitable concentrations of plasmoquine dihydrochloride. Determinations by the ether and other methods were found difficult, owing partly to the difficulty of determining satisfactorily the water-ether coefficient of plasmoquine, and partly to the wide separation of the constants and other causes.

"3. The constants as determined must be considered as the apparent constants, and under the circumstances noted in Section IV above it was found impracticable to carry out observations necessary to determine the true constants by the method of Moore and Winmill (1912)."

RASKINE (A. Ja.). Les résultats du traitement du paludisme par l'acriquine combinée à la quinoline No. 31. [**The Treatment of Malaria with Acriquine and Quinoline 31.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1939. Vol. 8. No. 6. [In Russian pp. 75–80. With 1 chart. French summary p. 80.]

A translation of the author's summary is as follows: —

"1. The treatment of malaria by the combined use of acriquine and quinoline 31 is effective.

"2. Administration by the mouth, for 5 successive days, of 0·1 gm. acriquine three times daily and 0·03 quinoline twice daily cuts short the fever of subtertian malaria in 3·0 days, and of benign tertian in 3·1 days.

"3. In subtertian malaria the schizonts disappear in 4·3 days, in benign tertian in 4 days.

"4. In subtertian the gametocytes disappear by the sixth day.

"5. Slight abdominal pain lasting 2 to 3 days was present in 16 cases. In all these cases the same preparations were given when treatment was repeated."

C. W.

CHOPRA (R. N.), ROY (D. N.), HAYTER (R. T. M.) & SEN (B.). **M 3, a New Drug in the Treatment of Malaria.**—*Indian Med. Gaz.* 1940. Jan. Vol. 75. No. 1. pp. 19–20.

The results of the administration of M 3 to a small series of patients have led the authors to the conclusion that the drug is without value in the treatment of malaria. It did not prevent relapses even after the administration of quinine, atebrin or plasmoquine. It did not improve the general condition of the patients to whom it was administered, nor did it cause any reduction in the size of the spleen. [See this *Bulletin* 1938, Vol. 35, p. 31]. *N. W.*

YAMAMOTO (Kinzaburō). Sulfanilamid in Malaria. [Abstract.] [**Sulphanilamide in Malaria.**]—*Japanese Jl. Dermat. & Urol.* 1939. Oct. 20. Vol. 46. No. 4. pp. 78–79.

The author treated 14 cases of induced malaria with sulphanilamide. In two cure was obtained after the administration of 15 gm. and 17·7 gm. respectively. In five no antimalarial effect was seen, but in seven, either the incubation period was lengthened, apparently by inhibition of the development of the plasmodia, or the paroxysms were temporarily suppressed, but returned on cessation of administration. Sulphanilamide is not, therefore, an efficient antimalarial drug. [Presumably the infection was with *P. vivax*, but this is not stated.]

C. W.

COVELL (G.) & AFRIDI (M. K.). **Antimalaria Operations in Delhi. Part II.**—*Jl. Malaria Inst. of India.* 1939. Dec. Vol. 2. No. 4. pp. 315–340. With 3 maps & 4 figs.

This is a detailed account of the various temporary or recurrent antimalaria measures adopted in the antimalaria campaign in the Delhi urban area. The organization is fully and clearly described. Insistence is rightly placed on the importance of unity of control in the carrying out of such measures on a large scale. This is effected by the provision of an independent checking staff working under the direction of an officer of the Malaria Institute of India. The efficiency of measures is thereby gauged and waste eliminated. The larvicide most frequently used is a mixture of diesel oil and cresol. The spraying of dwellings with pyrethrum insecticides is a measure to which much importance is attached. The annual cost of recurring antimalaria measures approximates two annas per head of the population protected, or two rupees per acre of ground to which measures are applied.

N. W.

WINCKEL (Ch. W. F.). Technique de l'impaludation thérapeutique. [**Technique of Therapeutic Malaria.**]—*Rev. du Paludisme et de Méd. Trop.* Paris. 1940. Apr. 15. Vol. 2. No. 10. pp. 97–109. With 8 charts. [14 refs.]

EPIDEMIC DROPSY.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

In the leading article of the *Indian Medical Gazette* (p. 748) it is shown that although poisoning with argemone oil produces symptoms indistinguishable from those of epidemic dropsy, the disease does not necessarily coincide with the common use of contaminated mustard oil. The suggestion is made that the condition may be due to the consumption of argemone oil by people whose diet, possibly through vitamin deficiency, has predisposed to the condition and that the process is one of "conditioned toxicity." BHATTACHERJEE (p. 749) brings further evidence to incriminate the seed oil of *Argemone mexicana* in the aetiology of epidemic dropsy. The diet of those subject to the disease is deficient in vitamin D.

PASRICHA *et al.* (p. 749) show that the toxicity of mustard oil contaminated with argemone oil is completely eliminated by heating to 240°C. for 15 minutes, but is not affected by heating to 150°C. They describe the pathological appearances of the various organs of animals receiving argemone oil: fatty degeneration and necrotic foci in the liver and acute haemorrhagic glomerulo-tubular nephritis. TRIBEDI and DE (p. 749) also describe the pathological appearances of epidemic dropsy. The basic characteristic is the dilated and engorged capillary angiomatous condition, which may be due to liberation of histamine. Note is made of the verrucoid eruptions on the skin [these are also referred to by PASRICHA *et al.* below]. Microscopically no signs of inflammation are seen.

CHOPRA *et al.* (p. 750) show that the sera of patients with epidemic dropsy have relative viscosity and surface tension below the normal. In chronic cases the cholesterol content of whole blood is increased and this may be a compensatory mechanism to increase the colloid-osmotic pressure, which is lowered by depletion of albumin.

PASRICHA *et al.* (p. 750) report an outbreak in boys in an institution where the mustard oil used contained about 1 per cent. of argemone oil. They discuss the red cell sedimentation rate in this condition. CHOPRA *et al.* (p. 751) also describe an outbreak in which argemone oil was incriminated. *C. W.*

SARKAR (Sarasi Lall). **Katakar Oil Poisoning.**—*Indian Med. Gaz.* 1939. Dec. Vol. 74. No. 12. pp. 752–753.

This short article, which appeared 14 years ago, is reprinted to show that argemone oil (katakar oil is the local name for the oil of *Argemone mexicana*) was more than suspected long before scientific investigation was taken up to prove the aetiology of epidemic dropsy. The article was abstracted at the time in this *Bulletin* [1927, Vol. 27, p. 238.]

H. H. S.

INDIAN MEDICAL GAZETTE. 1940. Dec. Vol. 74. No. 12. pp. 751–752. —**The Aetiology of Epidemic Dropsy.**

This leading article presents an excellent reasoned discussion on a vexed subject. The three theories of the causation of epidemic dropsy, first that there is an infecting organism or virus; second, that the condition is an intoxication, due to diseased rice, mustard oil, or an adulterant; third, that it is an avitaminosis, are all considered and discussed.

From a public health point of view the case would seem to be clear. Argemone oil (katakar oil) produces symptoms indistinguishable from those of epidemic dropsy, and investigations of recent outbreaks have shown that this adulterant of mustard oil was always present. It can be detected by a simple test of a colour change on addition of nitric acid to the mustard oil, and consequently, if this is the sole cause, prohibition or, better, prevention of the sale of argemone-contaminated mustard oil should eliminate epidemic dropsy.

The matter, however, is not quite so simple and clear-cut. The actual nature of the poison is not known, nor its mode of action. Argemone is a self-sown weed, a common contaminant of the mustard plant, and it is strange that epidemic dropsy is not more widespread. It is, for instance, comparatively rare among the poorer Anglo-Indians who use mustard oil very largely for cooking—perhaps the heating reduces its toxicity [see PASRICHA *et al.* below]. Again, rice, even sound rice, is generally thought to be bad for those suffering from epidemic dropsy, and it is further thought that those living on a diet in which rice enters largely are more susceptible to the disease and that rice, therefore, does play some part, even if a subsidiary part only. The author makes a potent suggestion that epidemic dropsy may be another example of "conditioned toxicity"—"the toxic effect of a toxic substance being conditioned by the nature of the diet or the state of vitamin saturation of the subject," other examples being selenium poisoning and high protein diet, and lead poisoning and vitamin C. [The article is a very stimulating one.] *H. H. S.*

BHATTACHERJEE (Niranjan). **An Investigation into the Etiological Possibilities of Epidemic Dropsy.**—*Calcutta Med. Jl.* 1939. Nov. Vol. 36. No. 5. pp. 350–363. [27 refs.]

This article adduces further evidence incriminating the seed oil of *Argemone mexicana*, a common adulterant of mustard oil. The whole is a useful summary giving a brief historical sketch, an account of the symptomatology and post mortem findings; the author gives figures showing the fall in serum calcium with the appearance of dropsy and analyses the diet of those subject to the disease, demonstrating the deficiency of vitamin D. He next describes the results of a test with a suspected mustard oil carried out on himself and six other volunteers, the actions and properties of *Argemone mexicana*, and of an alkaloid isolated from the suspicious oil sample, showing that it was identical with one obtained from the Mexican poppy. *H. H. S.*

PASRICHA (C. L.), LAL (S.) & BANERJEE (K.). **The Effects of the Oral Administration of Argemone Oil to Laboratory Animals.**—*Indian Jl. Med. Res.* 1940. Apr. Vol. 27. No. 4. pp. 947–951.

Oral administration of the expressed oil from seeds of *Argemone mexicana* has been shown by CHOPRA and his co-workers to give rise to symptoms of epidemic dropsy [see this *Bulletin*, 1939, Vol. 36, p. 909]. This oil is more toxic to laboratory animals than is mustard oil, but heating mustard oil adulterated with argemone oil to 240°C., "fuming temperature," for 15 minutes eliminates almost completely its toxicity. Guineapigs and white mice were used for these experiments. Animals received the standard stock laboratory diet, but those receiving argemone oil might lose 50 per cent. or even more in body-weight. Heating to 100° or even 150°C. was found not to affect the toxicity. The toxic action was particularly noticeable in the liver and kidneys. The former showed portal congestion and some degree of thrombosis, fatty degeneration of the cells throughout the lobules with small necrotic foci near the periphery. The kidneys showed acute haemorrhagic glomerulo-tubular nephritis and degeneration of the epithelium in the convoluted tubules and descending limbs of the loops of Henle. These changes resemble those due to diethylene dioxide (dioxane) but are more extensive. In addition to the above changes in liver and kidneys there is oedema of the gastric and intestinal mucosa, the vessels of the villi are congested and the epithelial cells are swollen, and desquamated.

If the results recorded above in animals—the heating of the oil to 240°C. deprives it of toxicity—are found to be true also of man, we have a ready means of controlling outbreaks of epidemic dropsy.

H. H. S.

TRIBEDI (B. P.) & DE (M. N.). **Observations on the Pathology of Epidemic Dropsy.**—*Calcutta Med. Jl.* 1940. Apr. Vol. 37. No. 4. pp. 209–220. With 17 figs. (3 coloured) on 10 plates. [10 refs.]

As stated in the title this article is concerned with the pathology, the morbid anatomy and histology, of epidemic dropsy as shown in two cases the findings of which are detailed. The basic characteristic is the "dilated and engorged capillary angiomatous condition," although this may constitute only part of the picture. There has

been much speculation whether this is the result of physiological demand caused by the poison of epidemic dropsy or not. One suggestion is that a large amount of histamine-like substance is liberated and causes capillary dilatation. Also the presence of *Argemone mexicana* as an adulterant of mustard oil may lead to the same effect by direct irritation or indirectly by liberation of histamine. The verrucoid eruptions on the skin and mucosae of some patients place the vascular condition almost in a class by itself [though they are seen in some cases of verruga peruviana and in onyalai]. Microscopically, no signs of any inflammatory reaction are seen, as if the poison, whatever it is, were a mild one, perhaps acting for a considerable time and having a special predilection for the blood vessels. The changes are well shown in the coloured plates and a series of photomicrographs. *H. H. S.*

CHOPRA (R. N.), MAZUMDAR (D. C.) & ROY (A. C.). **Some Observations on the Lipoid Content of the Blood in Epidemic Dropsy.**—*Indian Jl. Med. Res.* 1940. Apr. Vol. 27. No. 4. pp. 937–945. [14 refs.]

The sera of epidemic dropsy patients have been shown to have relative viscosity and surface tension below those of normal subjects, and from investigations carried out it would appear that nearly all the factors controlling the fluid exchange between the blood and the tissues are disturbed. The three main factors of this are: (1) The hydrostatic power of the blood which depends on its viscosity; (2) The osmotic pressure of the serum colloids which is lowered in epidemic dropsy; (3) Increase in permeability of the capillaries.

In some conditions with dropsy and with anaemia the blood cholesterol and lecithin undergo significant changes, and the present authors have estimated these in the whole blood, the plasma and the cells in 16 acute cases of epidemic dropsy, in 15 chronic and recurrent cases, in 6 with "marked erythema legs" and 2 with sarcoids. The resultant findings in each case are presented in protocols, but they may be summed up as follows: In acute cases the cholesterol content is within the normal range but the average is somewhat higher, 150·9 mgm. per cent., the normal average being 116 mgm. In chronic and recurrent cases it is increased, ranging between 184 and 250, with an average of 216·8, in the sarcoid cases a little higher, 219·3 [but there were only two sarcoid cases investigated]. The lecithin figures are normal in both acute and chronic cases, a little subnormal in those with sarcoids; but the individual figures show a much wider range than is found in normal subjects; in acute cases the limits were 7·0 and 12·0, in chronic cases 7·6 and 12·5.

The authors suggest that the raised cholesterol values "may be a compensatory mechanism to increase the colloid-osmotic pressure of the blood which is markedly lowered in epidemic dropsy due to a depletion of the albumin fraction." *H. H. S.*

PASRICHA (C. L.), LAL (S.), MALIK (K. S.) & BISWAS (P. K.). **An Outbreak of Epidemic Dropsy in a Closed Community.**—*Indian Med. Gaz.* 1939. Dec. Vol. 74. No. 12. pp. 733–735.

The institution at which this outbreak of epidemic dropsy was studied had been free from the disease between 1933 and 1939. The diet was varied and well-balanced. In January 1939, two boys

developed sarcoids accompanied by mild diarrhoea, and one showed slight oedema. In May, eleven more reported sick and were found to have oedema of the legs; by the following month 37 had diarrhoea, fever and, later, oedema. Seventeen showed sarcoids, from pin-point to 1/3 inch in diameter, the average being 2·4 mm. Examinations were carried out to exclude verruca. Other investigations were made, including corpuscle-sedimentation rate. This last is supposed to be increased in epidemic dropsy, but its limits are wide and, though the authors conclude that it is of value, this is not very clear. Of 16 boys suffering from epidemic dropsy the rate varied between 20 and 93 mm. in an hour and of 9 healthy boys between 19 and 122 mm. As the latter exhibited no clinical evidence of epidemic dropsy they are [somewhat arbitrarily, it would seem] classed as being in a "pre-epidemic dropsy state." In another case, a man with cardiac dropsy, the sedimentation rate was normal, indicating the value of the test in differential diagnosis. Investigation showed that the mustard oil used contained about 1 per cent. argemone oil. *H. H. S.*

CHOPRA (R. N.), PASRICHA (C. L.) & BANERJEE (K.). **An Outbreak of Epidemic Dropsy.**—*Indian Med. Gaz.* 1940. May. Vol. 75. No. 5. pp. 261–262.

This affords further corroborative evidence incriminating *Argemone mexicana*. In a certain institution the inmates could be divided into two groups which had the same diet, with one exception, the mustard oil, which was obtained from different sources. The groups used separate kitchens. In the one group were 27 adult women; fifteen presented the symptoms of epidemic dropsy and one developed a large pedunculated sarcoid. The mustard oil used by this group was found to contain 3–5 per cent. argemone oil. The other group, of about 100 persons, escaped entirely; the mustard oil used by these was found to be free from argemone oil. As soon as the outbreak was recognized the oil used was stopped and with this there were no more cases. *H. H. S.*

BERIBERI AND OTHER DEFICIENCY DISEASES.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

ROSEDALE (p. 752) gives details of the vitamin B_1, protein and mineral content of husked rice in comparison with polished rice, showing that the use of the former would go far to meet the dietary requirements of the people of Malaya. Supplementary foods necessary with a diet of polished rice are not easily available, husked rice is considerably cheaper and its digestibility is not noticeably different. The people should be educated in the use of unpolished rice.

BARLOVATZ (p. 753) describes an outbreak of beriberi in the Belgian Congo, in which most of the patients showed oedema, tachycardia and

evidence of nerve involvement. It appears that increased consumption of manioc consequent upon failure of the normal supplies of bananas was a feature of the diet in the patients concerned. SCHRETZENMAYR (p. 753) describes the X-ray appearances of the heart in wet beriberi; treatment with betaxin causes rapid reduction in the size of the heart, especially in the lateral measurement. The electrocardiographic changes are also described.

CHAMPY and COUJARD (p. 753) quote experiments with pigeons which show that in avitaminosis B_1 cold accelerates the onset of neuritis and plays a part in determining its localization. PORTO and DE SOLDATI (p. 754) have studied the histological changes in the hearts of dogs maintained on diets deficient in vitamin B_1.

KUCZYNSKI-GODARD (p. 754) regards protein deficiency as at least a part cause of certain conditions of which oedema is a feature.

CONCEPCION and PAULINO (p. 755) describe a method for estimating the vitamin C content of blood and have examined the blood of a number of normal Filipinos. A level of ascorbic acid in the blood plasma between 0·8 and 1·0 mgm. per cent. is satisfactory, but figures below 0·7 represent a pre-scorbutic condition. *C. W.*

ROSEDALE (John Lewis). **The Nutritive Value of Rice.**—*Jl. Malaya Branch Brit. Med. Assoc.* 1939. Dec. Vol. 3. No. 3. pp. 213–227. With 8 figs. [Summary appears also in *Bulletin of Hygiene.*]

Husked rice (from which the outer hard fibrous coat has been removed but where no polishing has been carried out) and polished rice were compared for their nutritive value. In Australia, husked rice is only two-thirds of the price of polished rice. It contains only 2·5 per cent. more fibre than the polished rice so its digestibility is not likely to be less. Its vitamin B_1 content is 1/10th that of yeast, while polished rice contains practically no B_1. With husked rice, 21·4 oz., equivalent to 2,200 calories, provide 53 gm. protein, whereas the same amount of polished rice provides 38 gm. As 58 gm. protein is considered about the average requirement of Singapore subjects, a diet of husked rice would go far towards supplying the protein requirement. The mineral content of husked rice is 1·03 per cent. as compared with 0·8 per cent. in polished rice. Na and Cl are double in husked rice, also the iodine content is higher than in polished rice. The equivalent of 2,200 calories of husked rice provides 0·56 gm. CaO, of polished rice only 0·08 gm. CaO. The same quantity of husked rice gives 19 mgm. iron, of polished rice 6 mgm. The Cu content of husked rice is double that of polished rice. More than three-quarters of the fat content of rice disappears on polishing. A number of foods representative of those eaten in Singapore were tested as supplements to a polished rice diet, but in no case could the difference between the two types of rice be bridged by any supplementary foods ordinarily available. In every case, husked rice was found to be more economical than the same amount of polished rice, as a greater amount of supplementary food was always required with the polished rice diet to produce a given increase of body weight in young rats. The poor man who can afford only meagre supplements to his rice diet will receive far greater benefit from his small monetary outlay if his rice is not polished. More water and 5 minutes' longer cooking are required when husked rice is used. It remains for administrative authorities to educate the people as to the value of unpolished rice. *Douglas C. Harrison.*

BARLOVATZ (A.). Une épidémie de béri-béri dans le Congo Oriental. [**An Outbreak of Beriberi in the Eastern Congo.**]—*Ann. Soc. Belge de Méd. Trop.* 1940. Mar. 31. Vol. 20. No. 1. pp. 1–12.

This outbreak affected men working on a mine who were on a restricted diet of manioc flour, their customary bananas or plantains having failed them. Two diets were analysed; one containing manioc flour, bananas, rice, meat, groundnuts and oil was found to supply 330–577 I.U. of vitamin B_1 daily; the second, containing more of the manioc, but less than one-third of the bananas supplied only 198–465 units. The first is as good as any native diet in Africa. With a caloric value of 3,000, 300 I.U. of vitamin B_1 is sufficient, especially if the carbohydrates do not exceed 500 gm. On the second diet the amount might be considerably below this.

In this outbreak 50 were attacked and four died. The prevalence of the chief symptoms was oedema of legs 44, of the face 19, generalized 8; cardiac dilatation 20, tachycardia 47, calf muscles painful on pressure 32, difficulty in walking 16, difficulty in rising from stooping position 10, inability to rise 4. The average stay in hospital was 67 days. On re-examination of the patients a year later a few still showed some disturbance of cardiac rhythm, but eventually recovery was complete. *H. H. S.*

SCHRETZENMAYR (A.). Röntgenologische und elektrokardiographische Studien am Beri-Beri-Hersen. [**X-Ray and Electro-Cardiographic Study of the Heart in Beriberi.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1939. Oct. Vol. 43. No. 10. pp. 427–440. With 11 figs.

X-ray photographs of the thorax demonstrate clearly the larger changes in the heart of wet beriberi patients and a series showing the conditions before and after treatment with betaxin confirm the clinical improvement by the rapid reduction in the size of the heart, especially the lateral measurement. Electro-cardiographic tracings show the remarkable changes in the picture as the cardiac state improves. By the X-ray three stages can be distinguished; of these the second, the form of enlargement, is regarded by the author as characteristic of beriberi, and the rapid diminution in the transverse diameter when vitamin B_1 is given is of great value in differential diagnosis. Of the cardiograph changes the fall of the T-wave when vitamin B_1 is given is seen only in severe cases of this avitaminosis; the shortening of the P-Q interval is not specific, being merely the result of rise in frequency. Disturbances of conductivity and stimulation have no essential part in the picture of deficiency of vitamin B_1. *H. H. S.*

CHAMPY (Christian) & COUJARD (Roger). Localisation et accélération par le froid des névrites de l'avitaminose B_1. [**Localization and Acceleration of Neuritis due to Avitaminosis B_1 as the Effect of Cold.**]—*C. R. Acad. Sci.* 1940. Jan. 22. Vol. 210. No. 4. pp. 150–152.

It is not generally known that an extraneous cause may localize the lesions of vitamin deficiency, nor, on the other hand, does frost-bite of the feet lead to neuritis. The authors kept pigeons and fowls on an avitamin diet such that polyneuritis occurred after 22–30 days. About 10–12 days before these symptoms were due some of these birds were placed in a cage so that their feet were in cold water (0° to —4°

in the case of some, −2° to −8° for others) 1–2 cm. in depth, controls being at laboratory temperature 12°–15°C. Other controls were given ordinary food but kept in the "cold" cage. After 3 days the deficiency birds in the cold had oedema of the feet, but none of the others showed this symptom. In another 24–48 hours there was "currant-jelly" oedema and desquamation. In the sciatic nerve the neuritis was clearly more marked in the same birds than in those at room temperature. In both, the nerve fibres showed degeneration with fatty change in the myelin, but these were much more numerous in the chilled animals; in fact, many of the fibres in those kept at 12°–15°C. showed little change, whereas nearly all the fibres were swollen and showed degenerative changes in the cases of the chilled. The authors conclude that in avitaminosis B_1 cold accelerates the onset of neuritis and plays a part in determining its localization.

H. H. S.

PORTO (J.) & DE SOLDATI (L.). Altérations microscopiques du coeur du chien en avitaminose B_1. [**Histological Changes in Dog's Heart in B_1 Avitaminosis.**]—*C. R. Soc. Biol.* 1940. Vol. 133. No. 4. pp. 726–728. With 2 figs.

Four dogs were given a diet deficient in vitamin B_1. Three died, the fourth was killed. All had exhibited typical general and cardiac symptoms of avitaminosis. Sections showed an interstitial oedema involving the interfascicular and interfibrillar fibres, vacuolization around the nuclei of the muscle fibres and more of the conducting paths. Some fibres presented homogenization or a hyaline change and patches of leucocytic infiltration. The longitudinal striation was more marked than normal, the transverse less. The right auricle showed the greatest degree of involvement, the right ventricle next and the auricular appendices less. These changes, state the authors, "are characteristic of B_1 avitaminosis, but not specific." *H. H. S.*

KUCZYNSKI-GODARD (Maxime H.). El hambre de proteínas, la anquilostomíasis, la coca y la opilación. [**Protein Deficiency, Ankylostomiasis, Coca and Opilación.**]—Reprinted from *Reforma Méd.* Lima. 1940. 7 pp. English summary.

This is a general discussion on conditions associated with oedema, but in general terms and not adducing any real evidence. The author quotes the statement that "deproteinization symptoms do not arise without hookworms, but ankylostomiasis never produces this symptom (oedema) in the absence of chronic alimentary deficiency." [The term "opilación" or the Portuguese "oppilação" is not easily translated. It has been used for constipation, for amenorrhoea, for the swelling of Chagas's disease and for hookworm; to cover all these it seems to mean "oedema."] It differs from beriberi in the absence of nervous symptoms. Those who indulge too freely in coca develop insomnia, jaundice, loss of appetite and some oedema; this too may be called "opilación." On these vague grounds the author is brought to believe that bouffissure d'Annam (Annam swelling), the Kwango syndrome of the Belgian Congo, opilación of the Amazon regions, and "oedema disease of the tropical rainy forest," together with hookworm oedema and that of coca excess are all due to protein deficiency, at least as part cause. [See also this *Bulletin*, 1939, Vol. 36, pp. 913, 914.] *H. H. S.*

CONCEPCION (Isabelo) & PAULINO (Peregrino), with the technical assistance of Solita F. CAMARA & Maria Luisa GARGARITANO. **Studies on Vitamin C: V. The Vitamin C Content of Normal Filipino Blood.**—*Jl. Philippine Islands Med. Assoc.* 1939. June. Vol. 19. No. 6. pp. 337–344. [16 refs.] [Summary appears also in *Bulletin of Hygiene.*]

Before deficiency of Vitamin C is evidenced by scurvy there must be a "prescorbutic stage" which it is important to estimate. There are three methods in common use to this end: (1) The capillary resistance test; (2) The urine saturation test; (3) Determination of the vitamin C content of the blood. Of these the last is the most promising and accurate.

As a preliminary to any study of changes it is essential to establish the normal standard and the authors have in this article recorded the results of examining 98 Filipinos, 44 males ranging in age between 14 and 52 years, average 26·8, and 54 females from 13 to 46, average 23·6 years. The method employed is the following:

"The blood was taken before breakfast and immediately after withdrawal was transferred to a test tube containing 10 mg. of KCN and 15 mg. of potassium oxalate. The plasma was separated by centrifuging. To 2 cc. of plasma were added 2 cc. of distilled water and 6 cc. of 10 per cent. metaphosphoric acid (made up fresh daily). The mixture was stirred for thirty seconds and allowed to stand for three minutes. In order to separate the protein precipitate from the protein-free fluid, the mixture was centrifuged. Two cubic centimeters of the supernatant fluid were used for the determination of ascorbic acid and placed in a 50 cc. beaker for titration with 2·6 dichlorophenol indophenol. Titrations to a pink end-point were carried out using ordinary light. The strength of the dye used was 0·5 gm. dissolved in 100 cc. of warm water heated to 85°C., shaken for fifteen minutes and filtered when necessary . . . .

"The ascorbic acid content of the red cells was assayed as follows: The red cells were washed four times with 0·9 per cent. sodium chloride solution containing 100 mg. per cent. of KCN and separated each time by centrifuging. After four washings, the volume was doubled by adding distilled water containing 100 mg. per cent. of KCN. To 2 cc. of this solution of hemolysed cells, 2 cc. of distilled water and 6 cc. of 10 per cent. metaphosphoric acid were added. The protein-free liquid was obtained and assayed in the same manner as that of the plasma."

The results are summarized in a series of tables. One shows the distribution of vitamin C values in plasma and red corpuscles, and is usually between 0·5 and 1·0 mgm. per cent., with extremes of 0·25 and 2·75. Another shows the distribution according to sex; the mean value in the males was $0{\cdot}94 \pm 0{\cdot}043$ and for females $1{\cdot}13 \pm 0{\cdot}03$. The vitamin C content of blood is said to vary with the amount in the food, with sex, pregnancy, lactation, and exercise. The authors found that pregnancy and lactation markedly lessened the content, and confirmed GREENBERG that the vitamin C content of the diet has marked influence on the blood ascorbic acid. They did not find any correlation between the ascorbic acid content of the blood and the weight of the subject. They conclude that "a level of ascorbic acid in the blood plasma between 7·8 and 1·0 mgm. should be considered sufficient and any figure below 0·7 should be considered insufficient or a pre-scorbutic condition." *H. H. S.*

REVIEWS AND NOTICES.

KUDO (Richard Roksabro) [D.Sc., Associate Professor of Zoology, Univ. of Illinois]. **Handbook of Protozoology.** Enlarged and completely rewritten edition.—pp. xi+689. With 291 illustrations. 1939. London: Baillière, Tindall & Cox, 7 & 8 Henrietta Street, W.C.2. [36*s*.]

A review of the first edition of this book published in 1931 was given in this *Bulletin*, 1931, Vol. 28, p. 693, and it was pointed out that this was a text-book of protozoology intended for students of zoology and that the medical aspects of the subject received only the attention which the protozoa involved justified from the purely zoological standpoint. The new edition, though very largely rewritten, has the same character as the first, so that it will have little use for medical men who wish to obtain information about the protozoa from the pathological point of view, but it will undoubtedly make an appeal to those who wish to go beyond the purely utilitarian limits and who wish to have a general conception of the group of protozoa as a whole. It is estimated that there are between 15,000 and 20,000 species of protozoa, and the portion of the book devoted to those of interest to medical men does not go beyond five and a half pages. There is an extensive systematic section of 470 pages and the whole is profusely illustrated with 291 figures, each of which contains up to as many as 20 separate drawings. The book will be an excellent reference book for students of protozoology, but for detailed information about any of the very numerous forms mentioned recourse will have to be had to more specialized books or monographs. *C. M. Wenyon.*

SVENSSON (R.) [D.S.O., M.C., M.B., B.Ch.]. **A Handbook of Malaria Control.** With a Foreword by Sir Malcolm Watson, LL.D., M.D., C.M., D.P.H., F.R.F.P.S.—73 pp. With 13 figs. & 6 plates. London: Ross Institute of Tropical Hygiene, London School of Hygiene & Tropical Medicine, Keppel Street, Gower Street, W.C.1.

This handbook is intended for the use of planters, engineers and other laymen who may undertake anti-malarial work, and contains in brief but attractive form a great deal of the information necessary to the understanding of the problems involved and to the practical application of the methods used. There is a chapter in which are given figures, largely drawn from the work of Sir Malcolm Watson, showing the reduction in malaria and other diseases which has taken place in certain localities after the institution of control measures. The nature of malaria and the principles of mosquito transmission are briefly explained, but the main part of the book is deserted to controls, especially larval control. The methods described are, of course, not new, but are explained shortly, and the reasoning on which they are based is clearly set out. Practical details of procedure in draining are given and should serve to prevent mistakes and wasted effort. The value and technique of oiling are stressed, and mention is made of the use of Paris green.

In appendices are given instructions on the collection and dissection of adult mosquitoes, the collection of larvae, the precipitin test and other matters, and there is a section of 17 pages in which are set down

the breeding habits and malaria-transmitting propensities of some 46 species of Anopheles throughout the world.

Modern work on malaria control has not been neglected in the preparation of the book, and although there is no pretence at completeness in dealing with so large a field, it will undoubtedly prove useful to those for whom it is intended provided that they work under the supervision of experts in anti-malarial measures who are qualified to decide as to the best procedures to be adopted in the local conditions which exist in the areas concerned. There are some good and helpful illustrations.

C. W.

HENRY LESTER INSTITUTE OF MEDICAL RESEARCH (SHANGHAI, CHINA). **Annual Report 1939** [EARLE (H. G.), Director].—58 pp. With 3 plates.

In this report reference is made to the work of H. C. HOU on beriberi. He has found that in most acute cases treatment by one injection of 5 mgm. thiamin [route not stated] followed by the administration of 3 mgm. a day by mouth is sufficient. In chronic cases administration by the oral route is satisfactory, and preparations such as marmite and yeast powders are less effective than pure B_1 or thiamin. Work on the inorganic elements in nutrition and on the assay of vitamin A in Chinese foods has been carried out by other members of the staff. In the refugee camps use was made of large quantities of orange peel infusion for the prevention of scurvy, and of soybean milk supplemented with lime salts and syrup, while soybean cakes of high nutritional value were prepared from residue. Infants were found to thrive well on a milk made from soybean-egg yolk powder.

Short sections on pharmacology and toxicology are included, and the results of blood group investigations are given ; work on parasitic trematodes has been carried out and the susceptibility of certain mosquitoes to experimental infection with *Mf. malayi* has been tested. Complete development was found to take place in *Culex pipiens* var. *pallens* and *C. vorax*, and the susceptibility of *A. hyrcanus* var. *sinensis* and *C. tritaeniorhyncus* was confirmed. *C. pallido-thorax* is a suitable host for *Mf. bancrofti*.

A list of papers published by members of the staff is appended ; many of these have already been abstracted in this *Bulletin*.

C. W.

LEAGUE OF NATIONS. HEALTH ORGANISATION. **Graphic Illustrations selected from the Publications of the Epidemiological Intelligence Service of the League of Nations for teaching Epidemiology and Vital Statistics.** C.H.1438.—46 mimeographed pp. With 55 loose pages of maps and graphs. [In French and English.]

This is a collection of loose maps and graphs showing the world-wide geographical distribution of a number of diseases :—diseases of childhood, cholera, diphtheria, dysentery, encephalitis lethargica, influenza, plague, acute poliomyelitis, scarlet fever, trypanosomiasis, typhus, undulant fever and yellow fever. Maps showing the distribution of

vectors are included. The first group of maps and graphs is concerned with births, infant mortality and general mortality rates, and brief notes in French and English are provided for all. The series is intended as an aid in the teaching of epidemiology and the maps and graphs have been prepared with a view to use with the epidiascope. From time to time it is hoped that they will be brought up to date by the issue of fresh sheets.

The series is excellent and should be of great service to teachers, especially in tropical medicine. *C. W.*

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